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UNITED STATES ARMY
COMMUNICATIONS-ELECTRONICS COMMAND



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FORT MONMOUTH, NEW JERSEY

ADVANCE PLANNING BRIEFING FOR INDUSTRY

"CECOM SENSOR ADVANCED TECHNOLOGY DEMONSTRATIONS"

OCEAN PLACE HILTON RESORT AND SPA
FEBRUARY 24, 1994

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Title: Proceedings

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3. CECOM Bottom Line: THE SOLDIER.

2 Encls

1. SEL Form 1012
2. Manuscript

for Marjorie Eichholz
for HENRY T. LEARNE
Chief, Public Affairs

2-10

**UNITED STATES ARMY
COMMUNICATIONS-ELECTRONICS COMMAND**



FORT MONMOUTH, NEW JERSEY

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BRIEFING FOR INDUSTRY**

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OCEAN PLACE HILTON RESORT AND SPA

FEBRUARY 24, 1994

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REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
HEADQUARTERS, US ARMY COMMUNICATIONS ELECTRONICS COMMAND
AND FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07030-5000



Office of the Commanding General

Ladies and Gentlemen:

On behalf of the Communications-Electronics Command (CECOM), I am pleased to present to you the proceedings of the "CECOM Sensor Advanced Technology Demonstrations" (ATDs) Advance Planning Briefing for Industry (APBI). The purpose of this briefing is to demonstrate to Industry how Sensor ATDs facilitate the integration of proposed technologies and how they provide the link between the technology developer, program executive officer and program manager.

Government and Industry must continue working together to meet the Army's needs with lower operational and support costs. I want to share with you the Army's on-going and future approved Advanced Technology Demonstrations at this Command and welcome your feedback to assist us in the future.

I welcome your participation in our APBI program.

Sincerely,

Otto J. Guenther
Major General, U.S. Army
Commanding

NOTICE

This publication contains the briefings presented during this Advance Planning Briefing for Industry (APBI). Following the APBI, you may obtain a Proceedings Book for a minimum fee, by contacting the Defense Technical Information Center (DTIC). The telephone number is (703) 274-7633.

We hope that the above publication proves beneficial to your long-range planning efforts. If you have any additional questions and/or suggestions, please contact the Program Analysis and Evaluation Directorate, AMSEL-PE-OD, ATTN: Mari Aufseeser, (908) 532-5054.

DISCLAIMER

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The information provided is accurate as of the time of publication, and may be subject to change.

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OF THIS PUBLICATION IS
UNCLASSIFIED**

ADVANCE PLANNING BRIEFING FOR INDUSTRY

FEBRUARY 24, 1994
OCEAN PLACE HILTON RESORT AND SPA
LONG BRANCH, NEW JERSEY

MEETING CHAIRMAN
DR. RUDOLF G. BUSER
DIRECTOR, NIGHT VISION AND ELECTRONIC SENSORS
CECOM

AGENDA

THURSDAY, FEBRUARY 24, 1994

0800 REGISTRATION

0800 OPENING SESSION

ADMINISTRATIVE REMARKS
Mr. Robert M. Calvello
Program Analysis and Evaluation Directorate
CECOM

0810 WELCOMING REMARKS
Mr. Robert F. Giordano
Director, Research, Development and Engineering Center
CECOM

0820 AN OVERVIEW OF THE NIGHT VISION AND ELECTRONIC SENSORS
DIRECTORATE
Dr. Rudolf G. Buser
Director, Night Vision and Electronic Sensors
Research, Development and Engineering Center
CECOM

0900 CECOM SENSOR ADVANCED TECHNOLOGY DEMONSTRATIONS -
A PEO PERSPECTIVE
Mr. Francis J. Schrenk
PEO Intelligence and Electronic Warfare

0920 AN OVERVIEW OF CURRENT ADVANCED TECHNOLOGY DEMONSTRATIONS
Mr. Larry L. Fillian
Night Vision and Electronic Sensors Directorate
Research, Development and Engineering Center
CECOM

0950 QUESTIONS AND ANSWERS

1000 BREAK

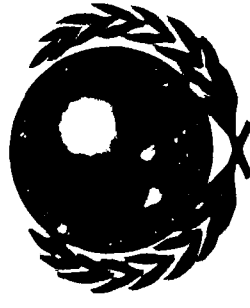
- 1405 ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT
FY96 Staff
Mr. Philip Perconti
Night Vision and Electronic Sensors Directorate
Research, Development and Engineering Center
CECOM
- 1420 QUESTIONS AND ANSWERS
- 1430 BREAK
- 1450 MASKED TARGET KILL ACT - FY96 Staff
Mr. Franklin T. Doppel
Night Vision and Electronic Sensors Directorate
Research, Development and Engineering Center
CECOM
- 1510 CLOSE-IN MAN PORTABLE MISSILE DETECTOR ACT AND FOLLOW-ON
PM-MOD DEVELOPMENT AND VEHICULAR MOUNTED MISSILE DETECTOR
TO AND FOLLOW-ON PM-MOD DEVELOPMENT - FY96 Staff
Mr. Robert G. Barnard
Night Vision and Electronic Sensors Directorate
Research, Development and Engineering Center
CECOM
- 1530 OFF-ROUTE SMART MISSILE DETECTOR ACT AND FOLLOW-ON
PM-MOD DEVELOPMENT - FY96 Staff
Mr. Richard L. Weaver
Night Vision and Electronic Sensors Directorate
Research, Development and Engineering Center
CECOM
- 1540 QUESTIONS AND ANSWERS
- 1550 CLOSING REMARKS
Dr. Rudolf G. Buser
Director, Night Vision and Electronic Sensors
Research, Development and Engineering Center
CECOM

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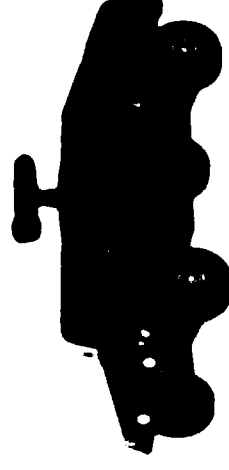
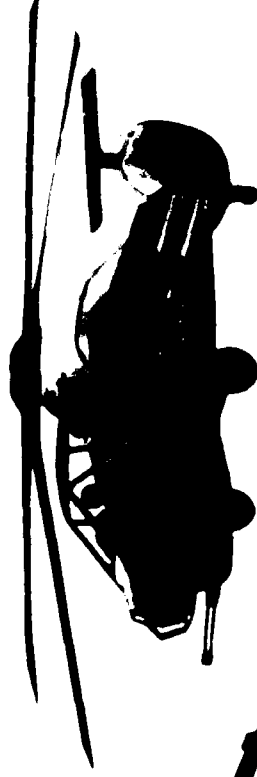
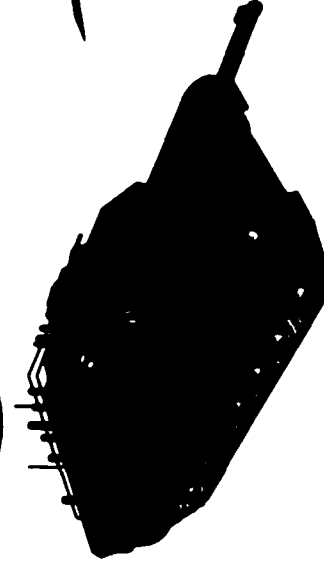
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OPENING SESSION

US ARMY CECOM

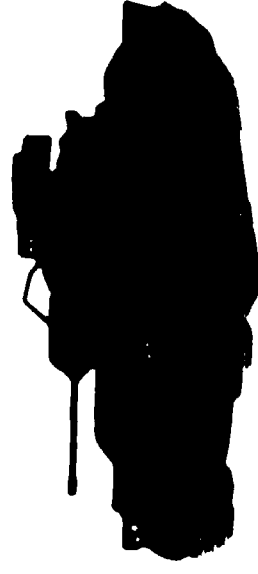
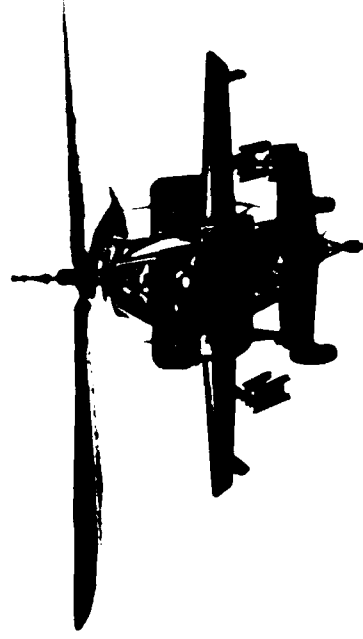


RESEARCH, DEVELOPMENT & ENGINEERING CENTER



Advanced Planning Briefing for Industry

“CECOM Sensor Advanced Technology Demonstrations”



UNCLASSIFIED

WELCOMING REMARKS



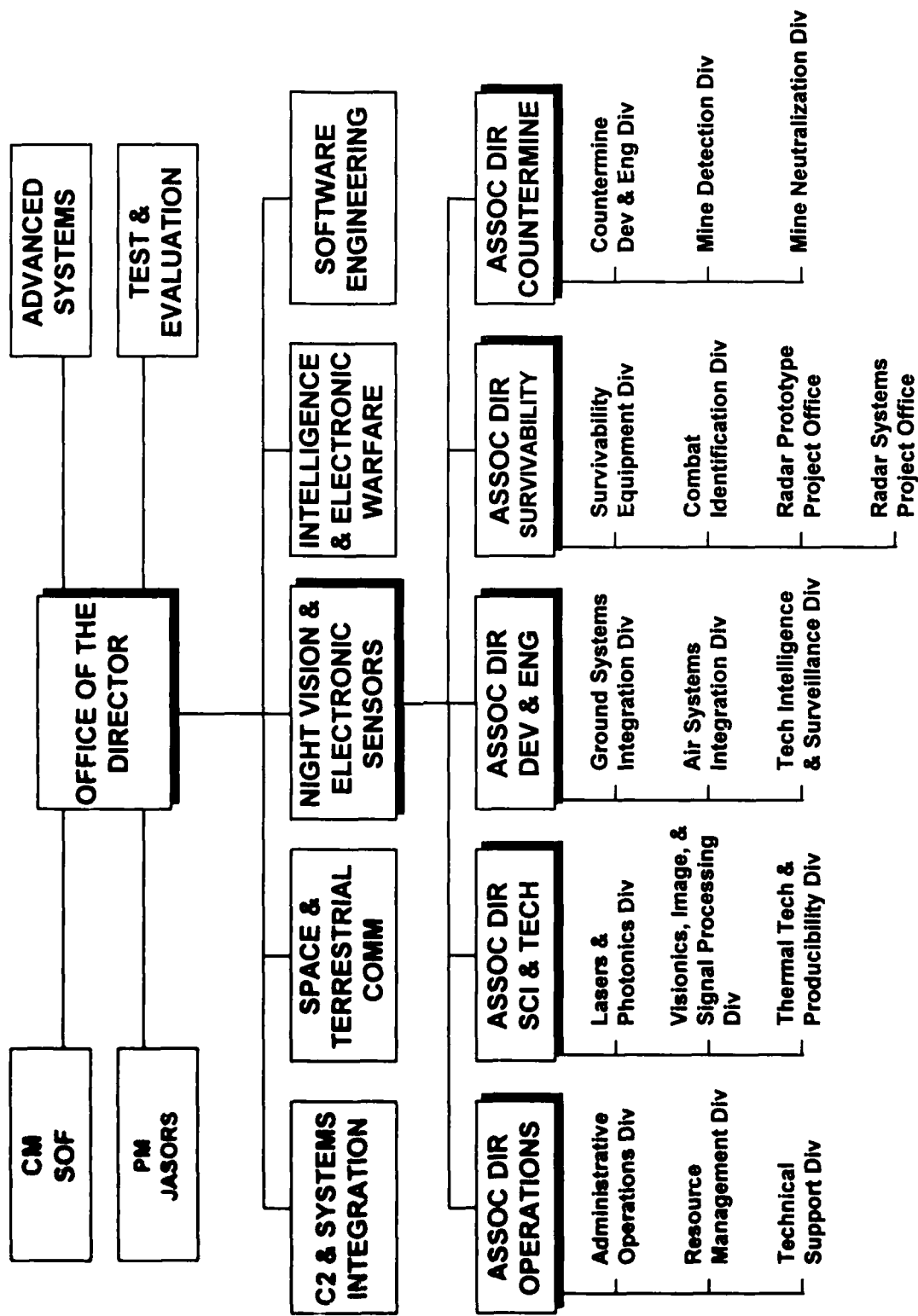
Mr. ROBERT F. GIORDANO

Director

Research, Development, and Engineering Center

CECOM

CECOM RESEARCH, DEVELOPMENT & ENGINEERING CENTER

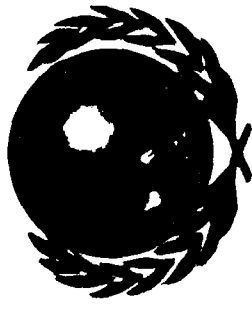


NOTES



CECOM RDEC

**Night Vision and Electronic Sensors
Directorate**



APBI "CECOM Sensor Advanced Technology Demonstrations"

**AN OVERVIEW OF THE
NIGHT VISION AND ELECTRONIC SENSORS
DIRECTORATE**

**DR. RUDOLF G. BUSER
DIRECTOR, NIGHT VISION AND ELECTRONIC SENSORS DIRECTORATE**

AMSEL-RD-NV

9 February 1994

POINT PAPER

SUBJECT: Night Vision and Electronic Sensors Overview

OBJECTIVE: Provide Industry with Upcoming Business Opportunities within the Night Vision and Electronic Sensors Technology Area for Advanced Planning.

FACTS: This paper presents an overview of the current and future programs being undertaken at the US Army CECOM RDEC Night Vision and Electronic Sensors Directorate showing key technology areas. In addition, the scientific underpinnings needed for future programs is discussed and contact opportunities for industry are illustrated.

BRIEFER: Dr. Rudolf G. Buser
Director, Night Vision and Electronic Sensors Directorate
ATTN: AMSEL-RD-NV-D
COMM: 703-704-1172

ACTION OFFICER
Thomas T. Steck
Resource Management Division
COMM: 703-704-1188

Communications Electronics Command



**Own the
Night**

**Own the
Spectrum**

**Digitize
the
Battlefield**

**Know the
Enemy**

**Provide the
S/W Force
Multiplier**

NIGHT VISION and ELECTRONIC SENSORS

MISSION FOCUS

Conduct Research, Development and Acquisition of Night Vision and Electronic Sensors and Sensor Suites to:

- **See, Control & Assess the Battlefield**
 - **Around the Clock - Fair or Foul Weather**
 - **Help the Soldier to “Own the Night”**

Cradle to Grave Concept

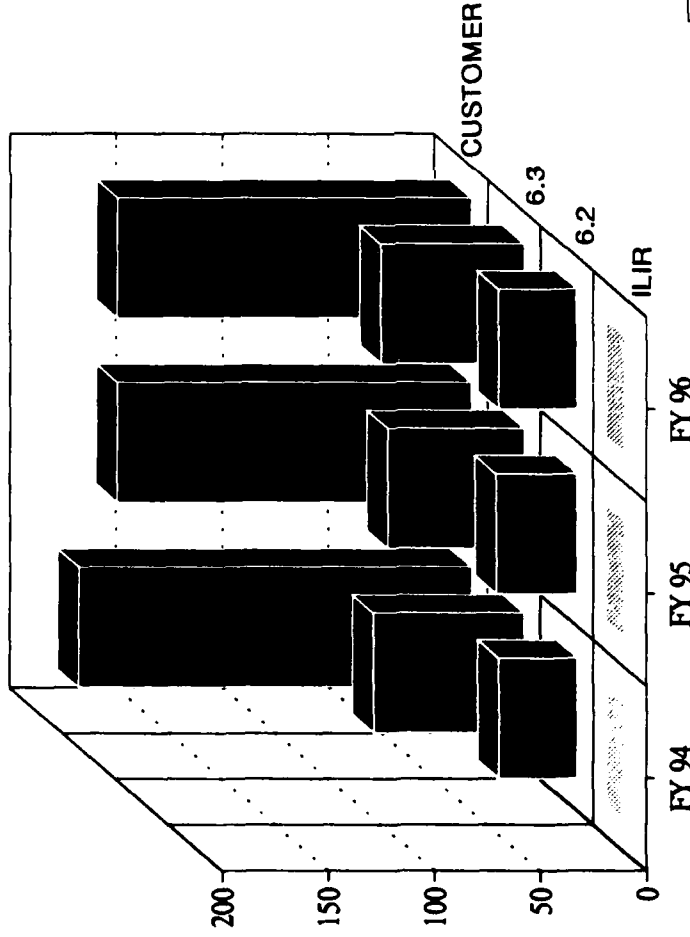
Night Vision and Electronic Sensors

Business Areas

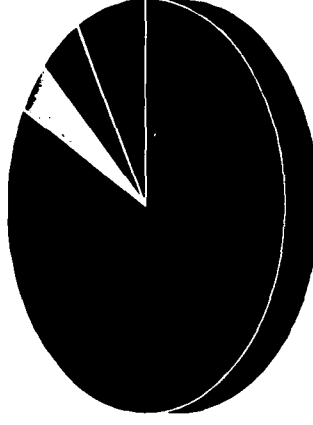
- • AIDED TARGET RECOGNITION
- ANTI-FRATRICIDE (COMBAT ID)
- COUNTERMEASURES (EO, IR, RF)
- • COUNTERMINE
- DECEPTION
- E - O MEASUREMENT AND SIGNATURE INTELLIGENCE
- • LASERS
- LOW COST/LOW OBSERVABLES
- OPTICS/IMAGE INTENSIFICATION
- PERFORMANCE MODELING/ANALYSIS
- PHYSICAL SECURITY
- RADIAC
- RADAR
- • SENSOR FUSION
- SURVIVABILITY EQUIPMENT
- • THERMAL IMAGING

NVES BUSINESS OUTLOOK MISSION/CUSTOMER

MILLIONS



- 6.2 TECHNICAL UNDERPINNINGS STRONG & STABILIZED
- 6.3 FOCUSED ON ARMY/DOD ATDs/ACTD's AND S&T THRUST AREAS
- CUSTOMER MANYRS STABILIZED THROUGH POM
- DUAL USE TECHNOLOGY LEVERAGING TO BE MAJOR THRUST
- HORIZONTAL INTEG MAJOR ACTIVITY DURING POM PERIOD



■ SALARIES ■ OTHER ■ OGA ■ CONTRACT

250-300MIL ANNUALLY

% IN-HOUSE 17

% OUT-HOUSE 83

Night Vision and Electronic Sensors

Customers

<u>Army</u>			<u>DoD</u>	<u>Other Gov't</u>
PMS:	Soldier	MSC's:	ARPA	DEA
NVEO	EW/RSIA	MICOM	NAVY	FBI
ITAS	CID	TACOM	Air Force	State
Abrams	Radar	AVSCOM	Marines	INS
Commanche	Firefinder	AMCCOM	DSMO	Transportation
AAH	JPS	ARL	SDIO	NASA
Cobra	Avenger			DOE
AHIP	LOSAT	MACOM		
M-60	FAAD	INSCOM		
Bradley	Javelin			
Tow				
AEC				
Mine/Countermine				
Stinger				
Survivability				
Physical Security				

RELIANCE PANEL PARTICIPATION

SENSORS

- ATDs/TDs
 - MSAT AIR
 - OASYS
 - AIMS
 - AHP
 - APA
- 2ND GEN TANK SIGHT
- DAY/NIGHT SENTRY
- IMAGE & SIGNAL PROCESSING
- SYSTEMS PERFORMANCE
- RADAR

EW

- EARLY WARNING DEVICES
- RADAR DECEPTION & JAMMING
- RF COUNTERMEASURES

ELECTRON DEVICES

- LASERS
- FPA
- PHOTONICS/FIBER OPTICS
- DISPLAYS

DIRECTED ENERGY

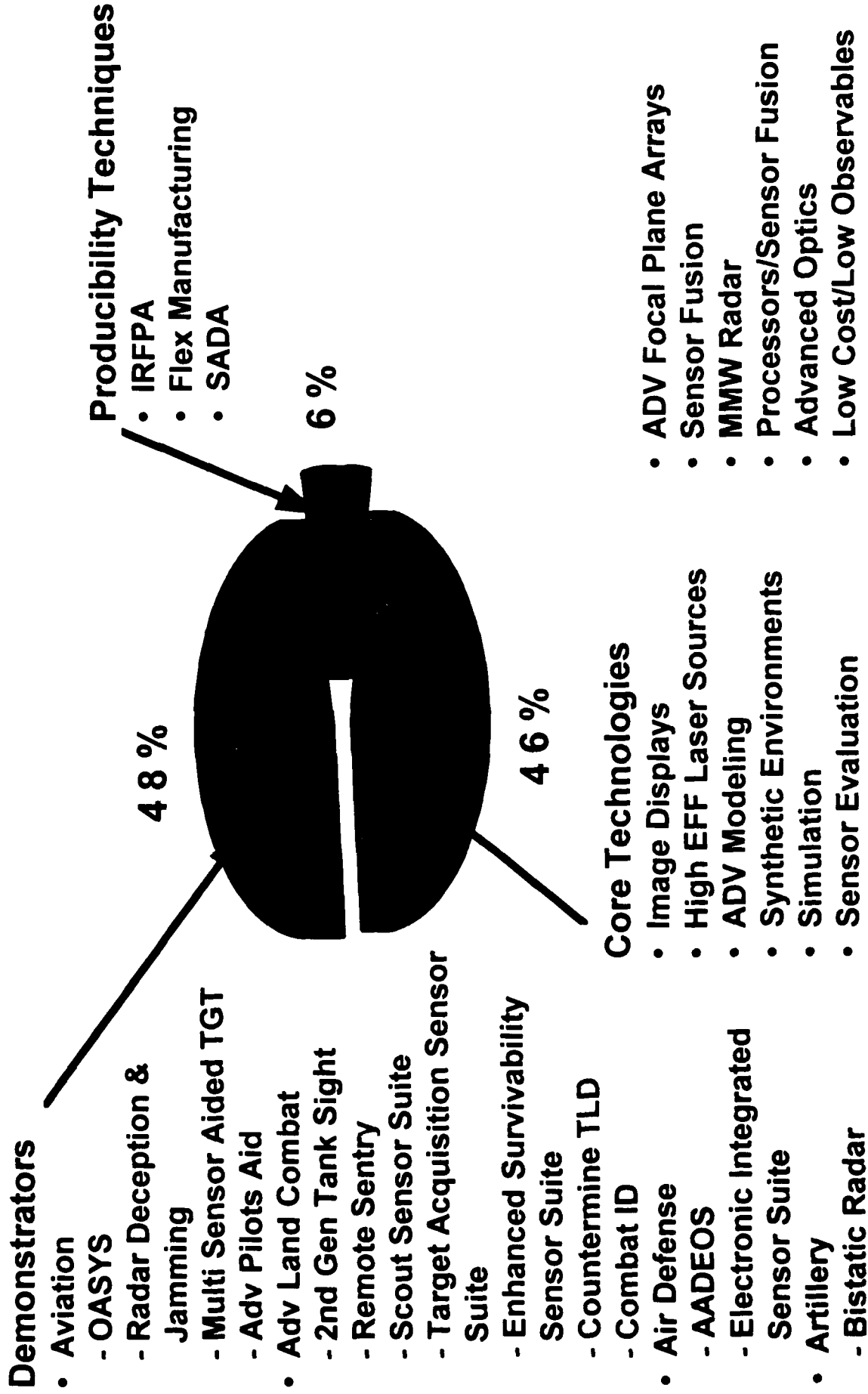
- LASERS
- ELECTRO-OPTICAL/INFRARED COUNTERMEASURES

PRODUCIBILITY

- OPTICS
- FPAs
- LASERS
- STANDARDIZATION OF COMPONENTS

NVESD SCIENCE AND TECHNOLOGY

Investment Strategy



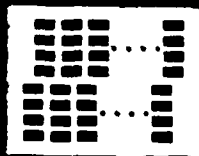
NIGHT VISION and ELECTRONIC SENSORS

EVOLVING REQUIREMENTS REQUIRE 2ND GENERATION TECHNOLOGY

- **Proliferation**
 - **World Is Catching Up on 1st Gen**
- **New Military Requirements**
 - **Longer Stand Off Ranges**
 - **Compatibility with Weapons System Automation**
 - **Increased Operational and Navigational Awareness**
 - **Implementation of Holistic Battlefield**

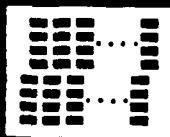
Second Generation FPA/Dewar/Cooler Standardized Building Blocks

High
Perform.

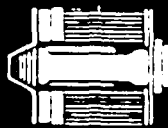


FPA

Mid/High
Perform.



Dewar



Compact
Systems



Cooler



1.75 W
Family I



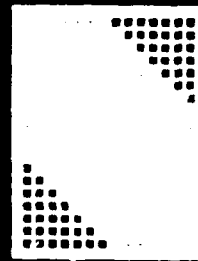
1.8 W
Family



0.15 W
Family

Second Generation FPA/Dewar/Cooler Standardized Building Blocks

Emerging Staring Families



480

640



320

240



256

256



64

64



Dewar



Cooler

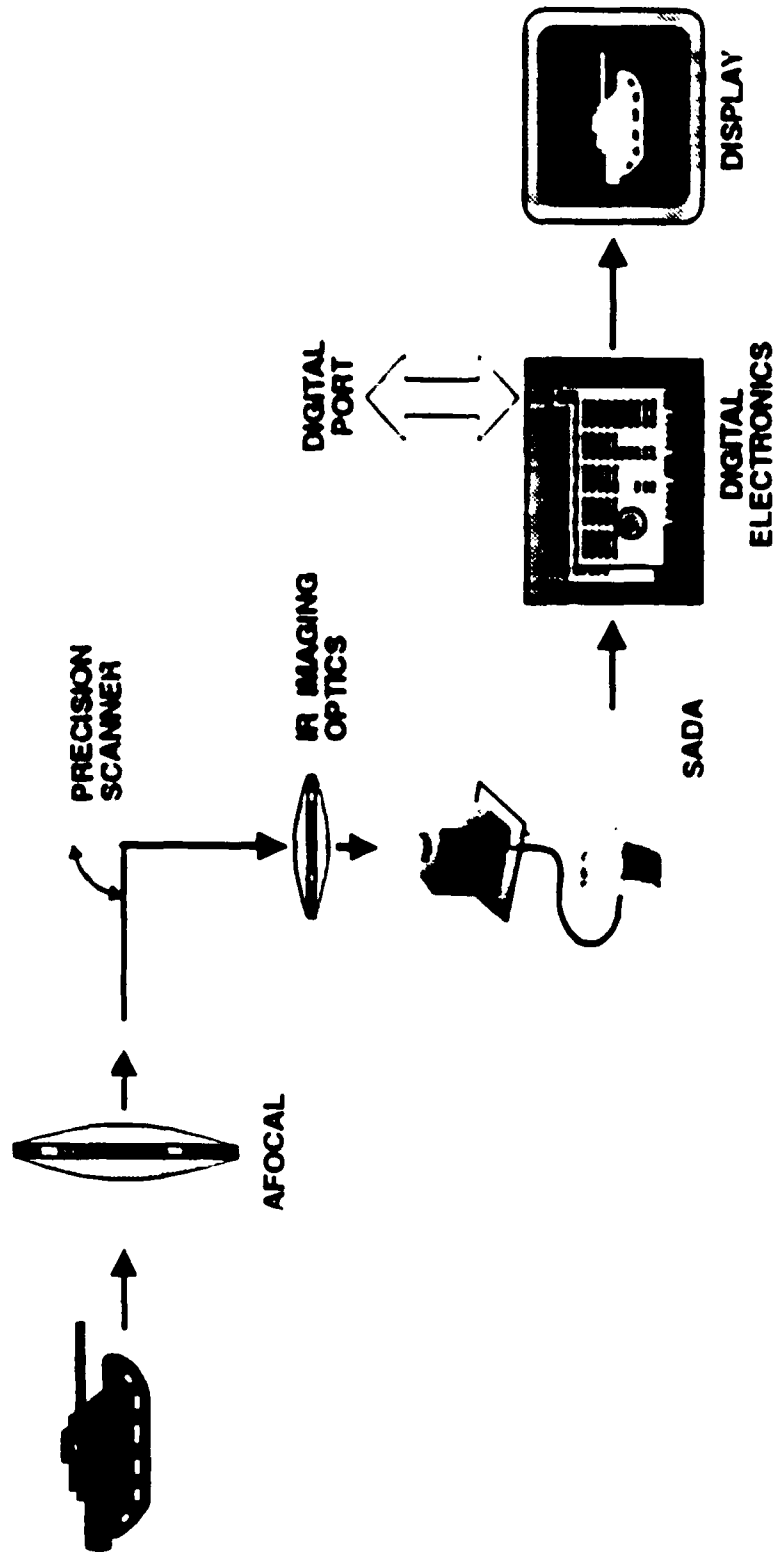


1.75 W



UNCLASSIFIED

Second Generation FLIR

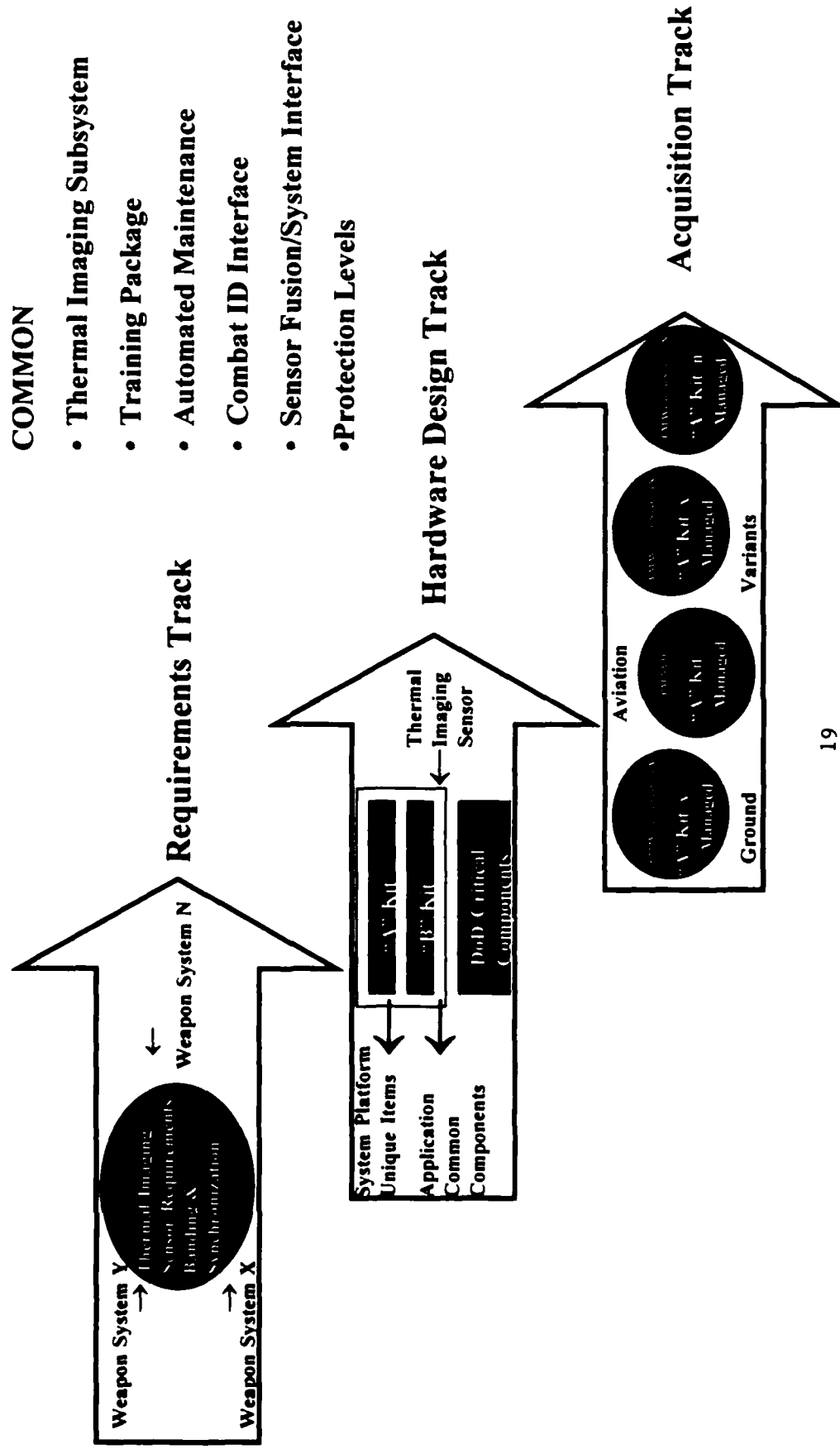


UNCLASSIFIED

DA SPECIAL TASKFORCE 2nd GEN FLIR HTI

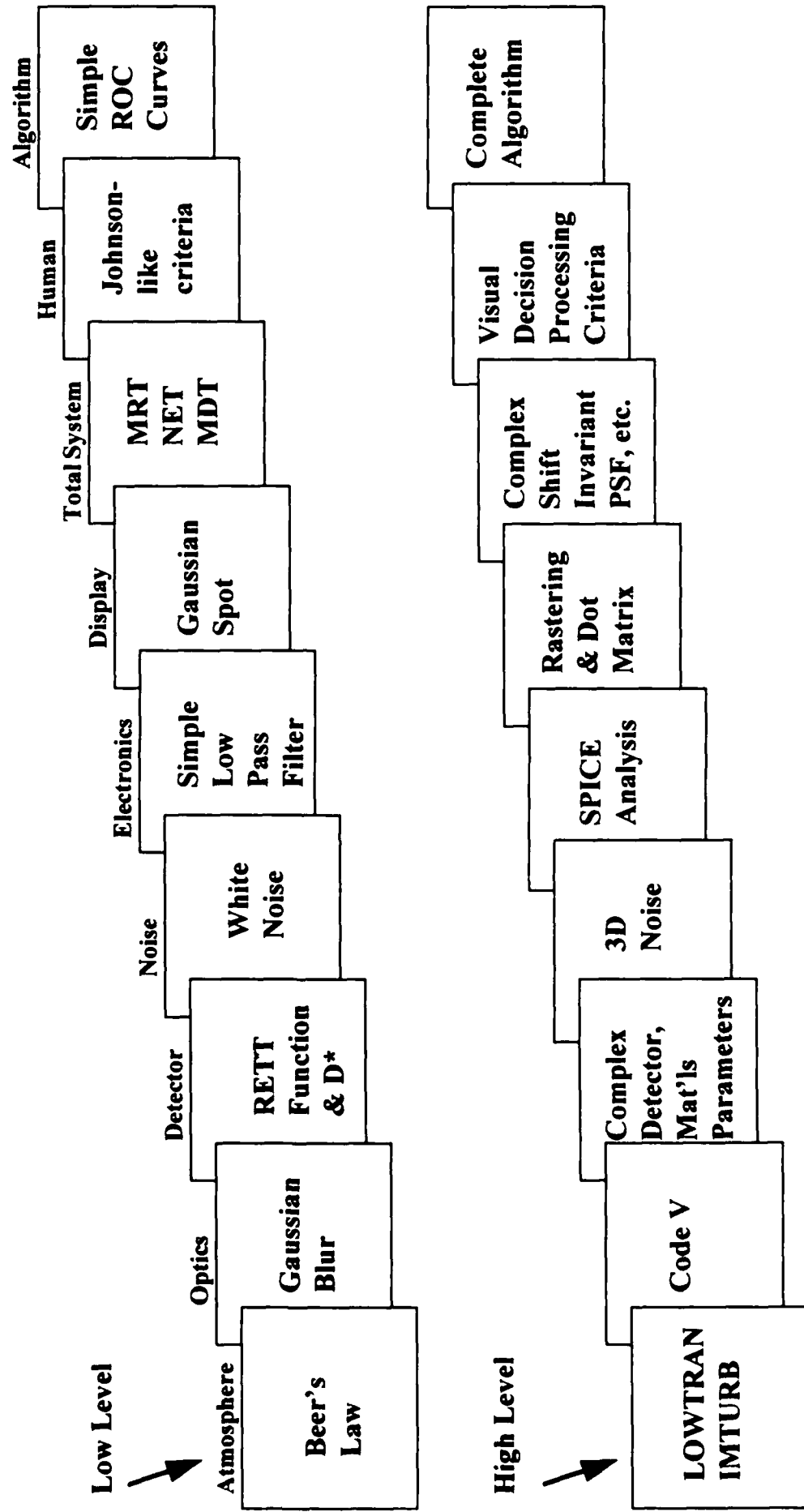
NIGHT VISION and ELECTRONIC SENSORS

A SYNCHRONIZED APPROACH



NIGHT VISION and ELECTRONIC SENSORS

ELEMENTS OF CAD/CAM PACKAGE



NIGHT VISION and ELECTRONIC SENSORS

2ND GENERATION

PHOTOVOLTAIC TECHNOLOGY

SCANNING

SIGNIFICANT IMPROVEMENTS IN IMAGE QUALITY OVER 1ST GENERATION

NOISE REDUCTION

IMPROVED SYSTEMS EFFICIENCIES LESS LEADTHROUGHS, REDUCED POWER, STANDARDIZATION ESTABLISHED

DIGITIZATION FOR INFORMATION PROCESSING AND TRANSPORT

STARING

LESS MATURE, EMERGING CAPABILITY

HIGH IMAGE QUALITY

REPRESENTATIVE APPLICATIONS WITH ATRs WILL REQUIRE LARGE AREA ARRAYS

3RD GENERATION

SMART FOCAL PLANE ARRAY

MULTI-SPECTRAL

MULTI-TEMPORAL

LOCAL PROCESSING

OPTICAL NEURAL NET IMPLEMENTATION FOR FUTURE ADVANCES

NIGHT VISION and ELECTRONIC SENSORS

2ND GENERATION SUMMARY

- **Detector Technology Mature and Optimized**
- **Scanning FPA Assemblies Highly Mature**
- **Staring FPA Assemblies Emerging**
- **Manufacturing Cost Issues Being Addressed**

MANY SYSTEMS APPLICATIONS FEASIBLE

NIGHT VISION and ELECTRONIC SENSORS

SENSOR FUSION

REQUIREMENTS

- **High Target Detection/Identification value; Low false alarm rate**
- **Functional integration/single aperture for multiple use/Stealth requirements**

APPROACH TO SENSOR FUSION

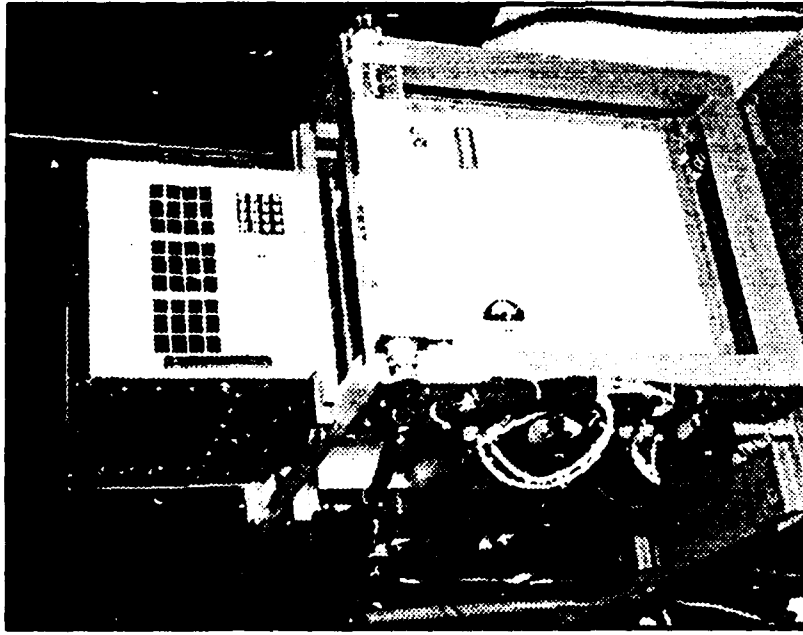
- **Image Fusion**
- **Feature Fusion**
- **Pixel Fusion**
- **Information Fusion**

NIGHT VISION and ELECTRONIC SENSORS

SENSOR OPTIONS MATRIX

	Pilotage/Navigation	Fire Control	Survivability
TV (Daylight)	X	X	X
FLIR	X	X	X
RADAR	X	X	X
LADAR/RF	X	X	X
ACOUSTICS		X	X

HAC MTAP



1800 Watts

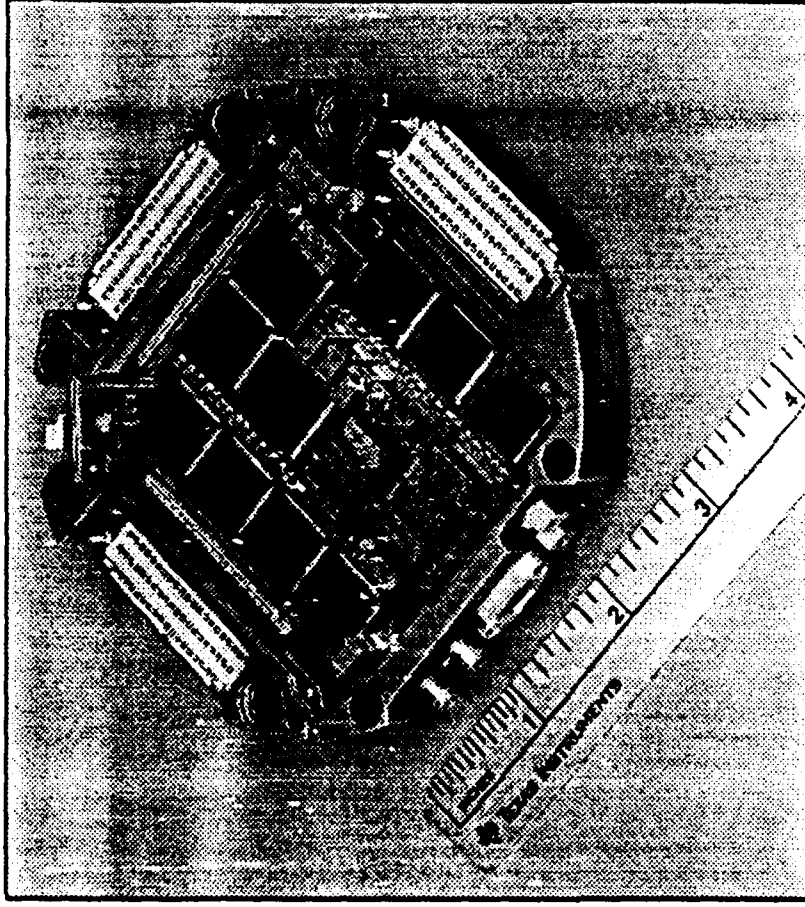
400 Lbs

250 MOPS

1989



BASIC PROCESSING MODULE



75 Watts

0.5 Lbs

500 MFLOPS

1996

NIGHT VISION and ELECTRONIC SENSORS

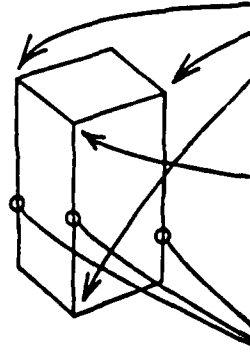
MULTI-SENSOR FUSION - TECHNICAL CHALLENGES

- Algorithms - must capitalize on all sensor information:
 - Feature level fusion of sensor data
 - Utilize detailed signatures in both spectral domains (internal detail)
- Sensors - must provide detailed/reliable target signatures at extended ranges:
 - FLIR: 2ND GEN FPA, improved S/N, resolution and sampling
 - MMW: High range resolution, polarization to reduce false alarms, doppler for MTI
- Systems - integrated system approach:
 - Rapid, wide area scan techniques
 - Multi-sensor operational modes
 - Man-machine interface/displays

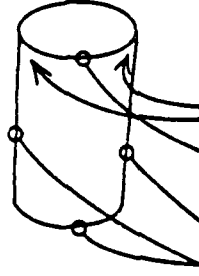
TARGET ACQUISITION/ IDENTIFICATION COMPONENTS

Vertices & Edges Produce Activation of Geometric
Primitives Due to Orientation Invariant.

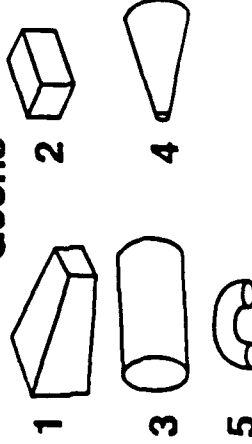
Brick



Cylinder



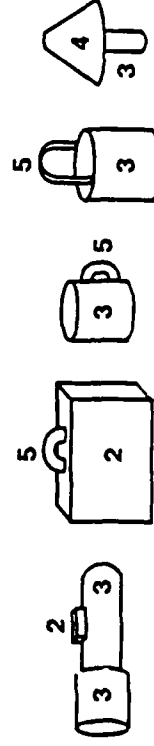
Geons



Characteristics of Geons

1. Can Be Determined from General Viewpoint.
2. Robust to Noise.
3. Require Only Categorical (Rather Than Metric) Discrimination.
4. Two or Three Are Sufficient for Basic Level Classification.

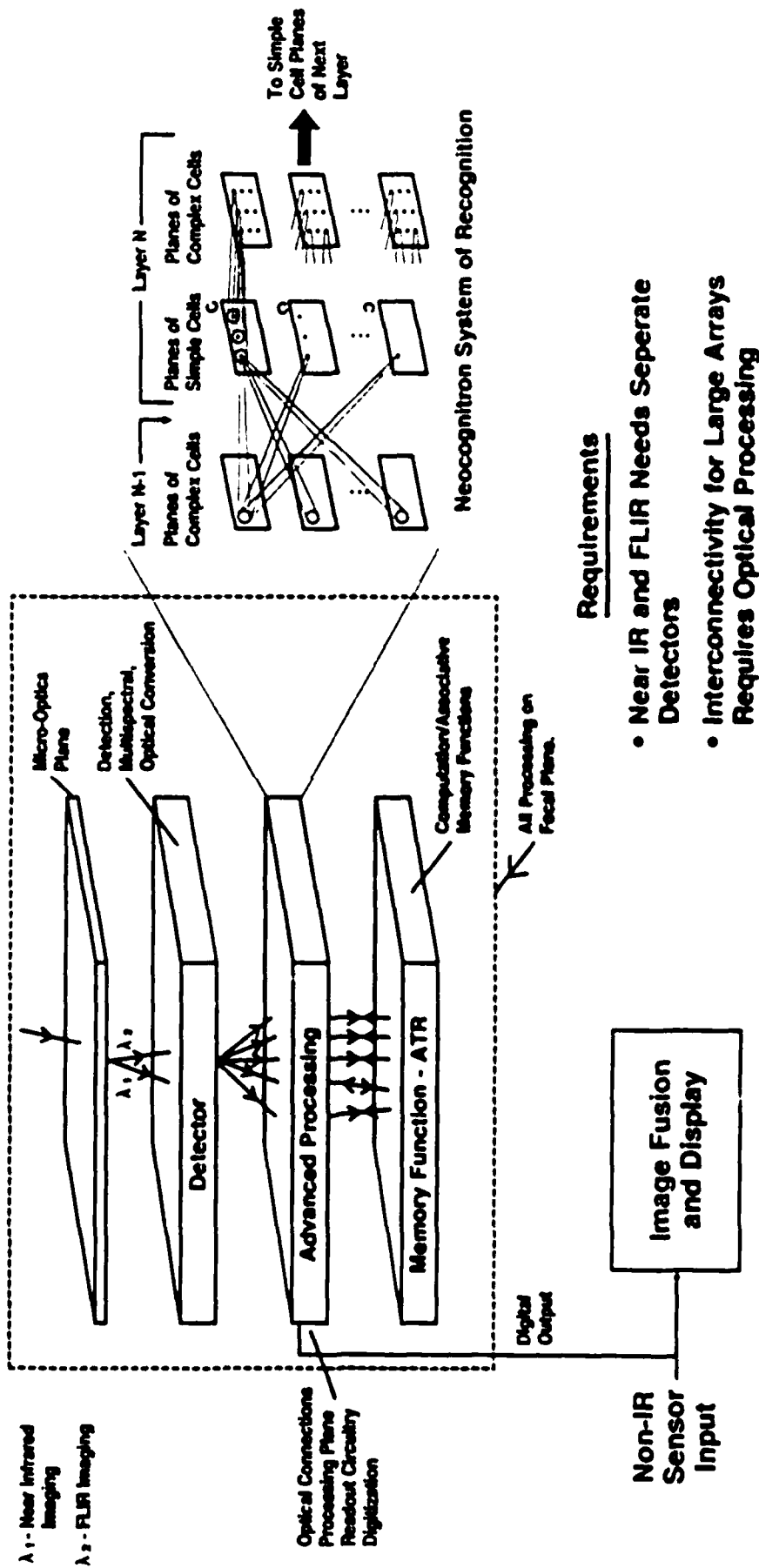
Objects



Geons in Combination with Spatial Relations,
Produce Recognition of Objects.

From: Biederman (1987)

FUTURE ARCHITECTURAL CONCEPT



Requirements

- Near IR and FLIR Needs Separate Detectors
- Interconnectivity for Large Arrays Requires Optical Processing

NIGHT VISION and ELECTRONIC SENSORS

TARGET ACQUISITION/FIRE CONTROL FUNCTIONS

- **Rangefinder**
- **Designator**
- **Eyesafe training and weapon simulation (MILES compatibility)**
- **Electro-optical and optical detection**
- **Advanced target detection and identification**
- **Imaging**
- **Gated illuminator**
- **Tracking**
- **Pointer/Aiming**
- **Downrange wind measurements**
- **Closed loop fire control**

PROPOSED MULTI-FUNCTION RANGEFINDER/OASYS

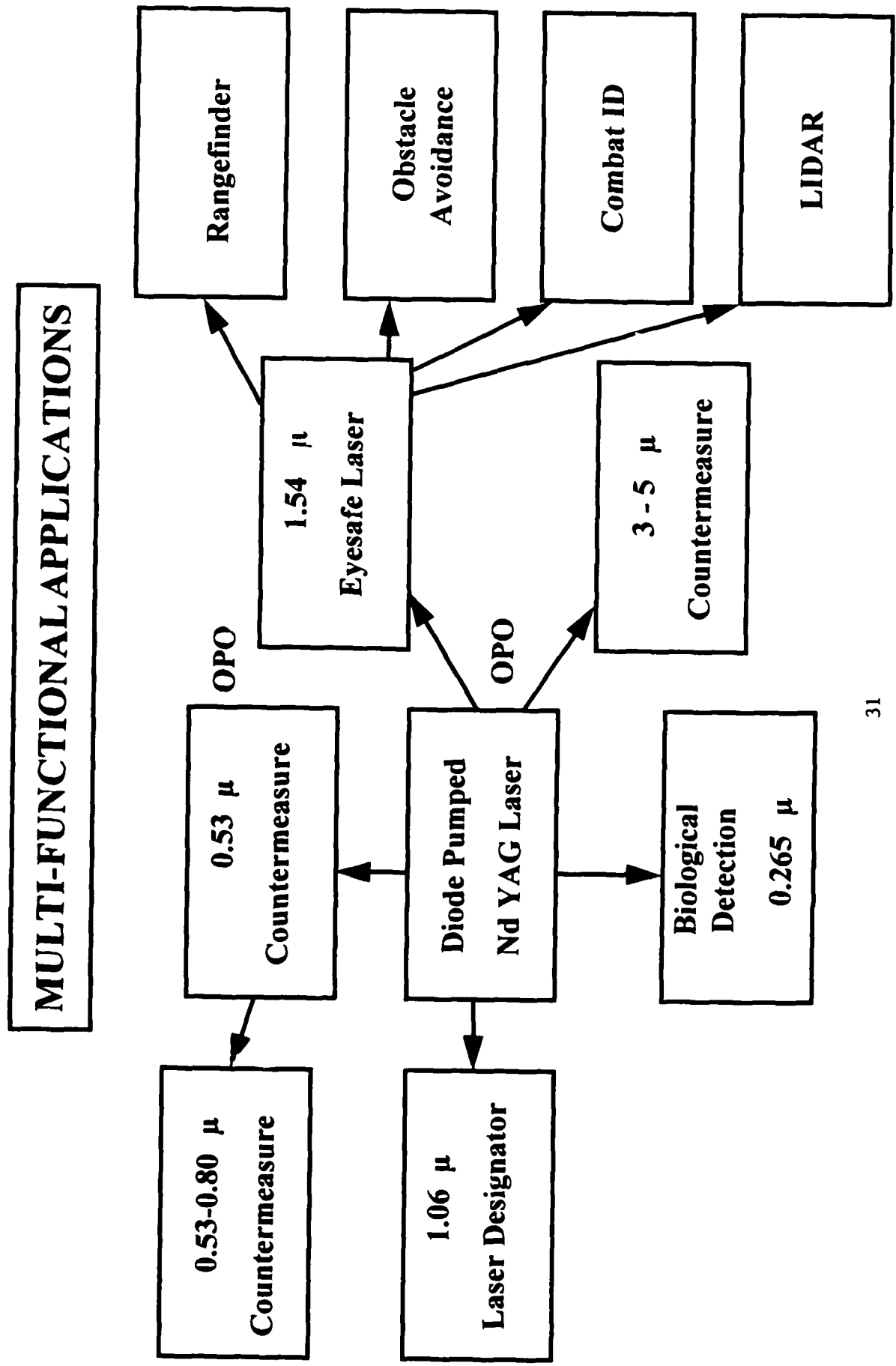
System Parameter	Current Rangefinder	Proposed multifunction system				
		Range- finding	Obstacle Avoidance terrain following	Range Assisted ATR	Target Identification (1)	Pulse gated ranging
wavelength (μm)	1.06	1.54	1.54	1.54	1.54	1.54
energy/pulse (mj)	10	0.1	0.1	0.1	0.1	0.1
repetition rate (Hz)	5	2 ms burst containing 30 pulses (3)	15,000	15,000	15,000	15,000
divergence (mr)	0.7	1.5	1.5	1.5	1.5	1.5
beam aiming	3 axis gimbal	1 axis gimbal (2)	1 axis gimbal	1 axis gimbal	1 axis gimbal	1 axis gimbal

(1) range resolution 4 inches

(2) remaining 2 axis provided by optical scanner of OASYS

(3) Rangefinder operates at 15 KHz repetition rate. Pulse integration provides required range despite lower energy per pulse.

NIGHT VISION and ELECTRONIC SENSORS



NIGHT VISION and ELECTRONIC SENSORS

TOP 5 FUTURE JOINT WARFIGHTING CAPABILITIES

- **To maintain near perfect real-time knowledge of the enemy and communicate that to all forces in near real-time**
- **To promptly engage regional forces in decisive combat on a global basis**
- **To employ a range of capabilities more suitable to actions at the lower end of the full range of military operations which allow achievement of military objectives with minimum casualties and collateral damage**
- **To control the use of Space**
- **To counter the threat of weapons of mass destruction and future ballistic and cruise missiles to the CONUS and deployed forces**

NOTES

IEW

PROGRAM EXECUTIVE OFFICE

Advanced Planning Briefing

to

**Industry
(APBI)**

“CECOM Sensor Advanced Technology Demonstrations”

A PEO Perspective

FEBRUARY 1994

**Frank Schrenk
Chief, System Engineering Division
Program Executive Office**

SFAE-IEW-SE

DATE: 14 February 1994

POINT PAPER

SUBJECT: ADVANCED PLANNING BRIEFING TO INDUSTRY (APBI)

PURPOSE: To brief APBI on PEOIEW activities related to Advanced Technology Demonstrations (ATDs).

FACTS:

- PEOIEW is working closely with CECOM in the development of ATDs. This close working relationship offers a unique opportunity to apply newly developed technologies to current and future programs to help meet real world threats. Some of the programs associated with these developments may offer insight to industry of the technological areas currently being developed and explored.

- This briefing is intended to provide industry some insight into PEOIEW programs as they relate to technology which is currently being developed by CECOM.

BRIEFER: John H. Cooper, GS-14, SFAE-IEW-SE, DSN 229-5932

RELEASED BY:

FRANCIS J. SCHRENK
GS-15
C, SYSTEMS ENGR DIV/PEO IEW
DSN 229-5183

ACTION OFFICER:

RANDALL L. DICKSON
GS-14
LOGISTICS MANAGER/PEO IEW
DSN 229-5933

PEO Mission Statement

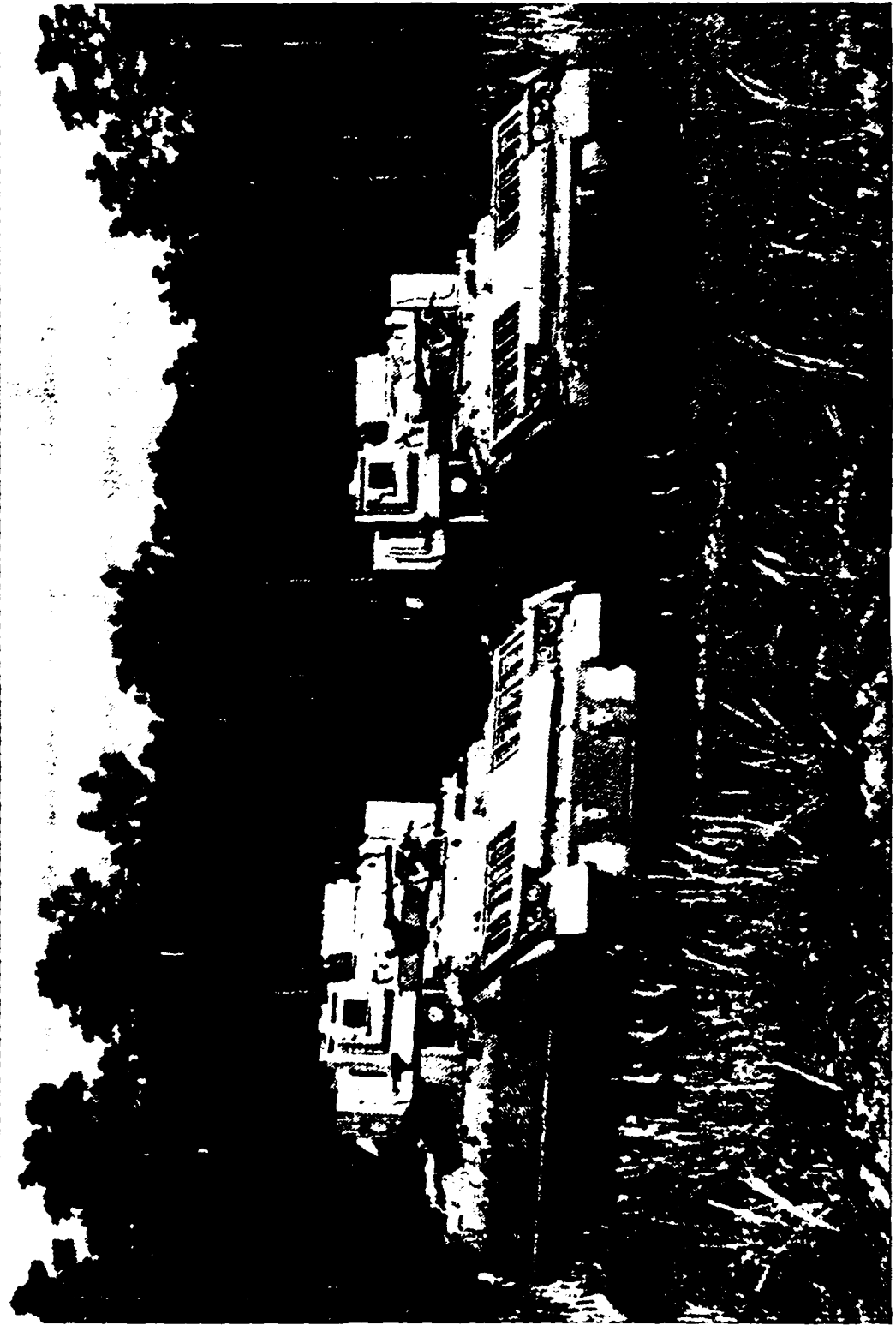
Develop, test, produce and field operationally ready, interoperable and supportable systems and equipment to accomplish the Army's mission for:

- **COMBAT IDENTIFICATION**
- **TACTICAL GROUND and AIRBORNE SURVEILLANCE**
- **SIGNALS INTELLIGENCE**
- **NIGHT VISION**
- **TARGET ACQUISITION**
- **ELECTRONIC WARFARE**
- **HOSTILE WEAPONS LOCATION**



STINGRAY

System Hardware



IEW

PROGRAM EXECUTIVE OFFICE

AN/VLQ-7 () STINGRAY System Description

STRINGRAY is an Electro-optic Countermeasure (EOCM) and Target Acquisition Device Designed to Increase Combat Force Survivability by Denying the Opposing Force the Ability to Use Their Target Acquisition and Fire Control Systems.

Leverage of ATDs

- **Common Ground Station (CGS)**
- **Survivable Adaptive Systems (SAS)**

IEW

PROGRAM EXECUTIVE OFFICE

Common Ground Station ATD Concept



IEW

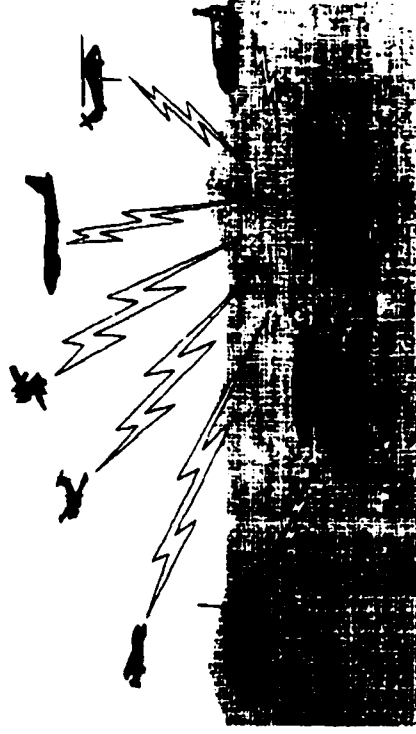
PROGRAM EXECUTIVE OFFICE

Common Ground Station (CGS) ATD

OBJECTIVE

- DEVELOP & DEMONSTRATE THE PROOF-OF-CONCEPT TECHNOLOGY FOR PROVIDING RESPONSIVE, TIMELY AND USABLE COMBAT INFORMATION AND INTELLIGENCE DATA TO BRIGADE COMMANDER
- DEMONSTRATE CRITICAL TECHNOLOGY SOLUTIONS FOR THE JOINT STARS BLOCK II END

CGS ATD Concept



CGS ATD Program Schedule

	FY-93	FY-94	FY-95	FY-96
OPERATOR CONSOLE DEVELOPMENT	△			
DESERT CAPTURE				
SIMULATION AND MODELING				
CGS ARCHITECTURE & DISTRIBUTED DATABASE DEVELOPMENT				
TECH SYSTEM DEMONSTRATOR				
ADV ANTENNA DEVELOPMENT				
INTELL DISSEMINATION DEMO				
UNFUNDED ON-THE-MOVE				
ANTENNA DEVELOPMENT				

APPROACH

- EARLY EFFORTS TO CONCENTRATE ON SIMULATION AND MODELING
- SIMULATE CGS FUNCTIONALITY DEVELOPMENT USING MAN-IN-THE-LOOP CONCEPT
- DEVELOP BRIGADE DEMONSTRATOR BUILT AROUND A SCALABLE, PLATFORM INDEPENDENT, TAILORABLE OPEN ARCHITECTURE APPROACH ON A HMMWV
- INTEGRATE, DEMONSTRATE & SIMULATE DISSEMINATION OF INTEL PRODUCTS FOR THE BRIGADE

- **Wideband Wireless CP**
- **Tactical Multinet Gateway**
- **Automated Net Management**
- **Fiber Optics Corps LAN**

IEW

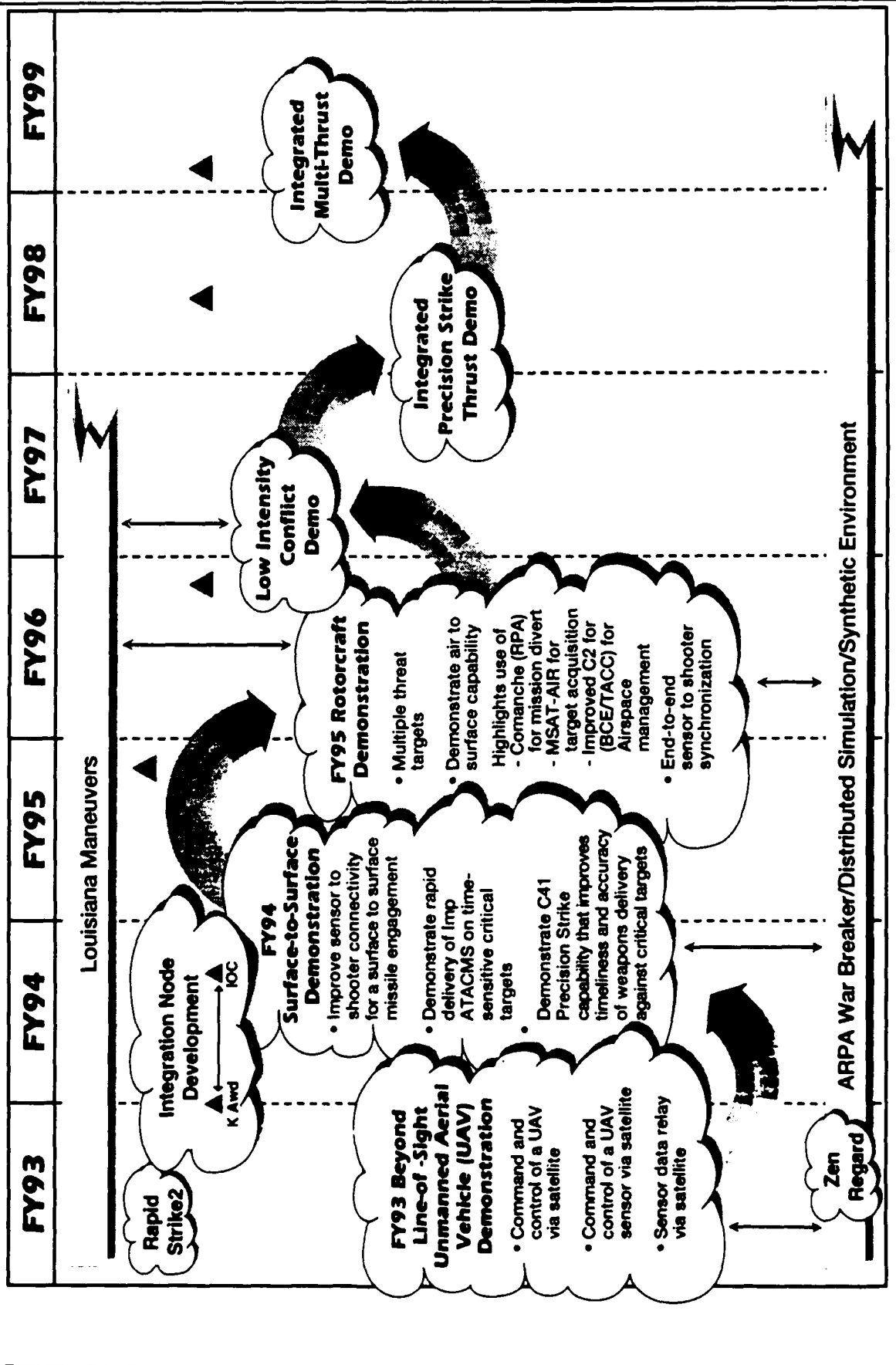
PROGRAM EXECUTIVE OFFICE

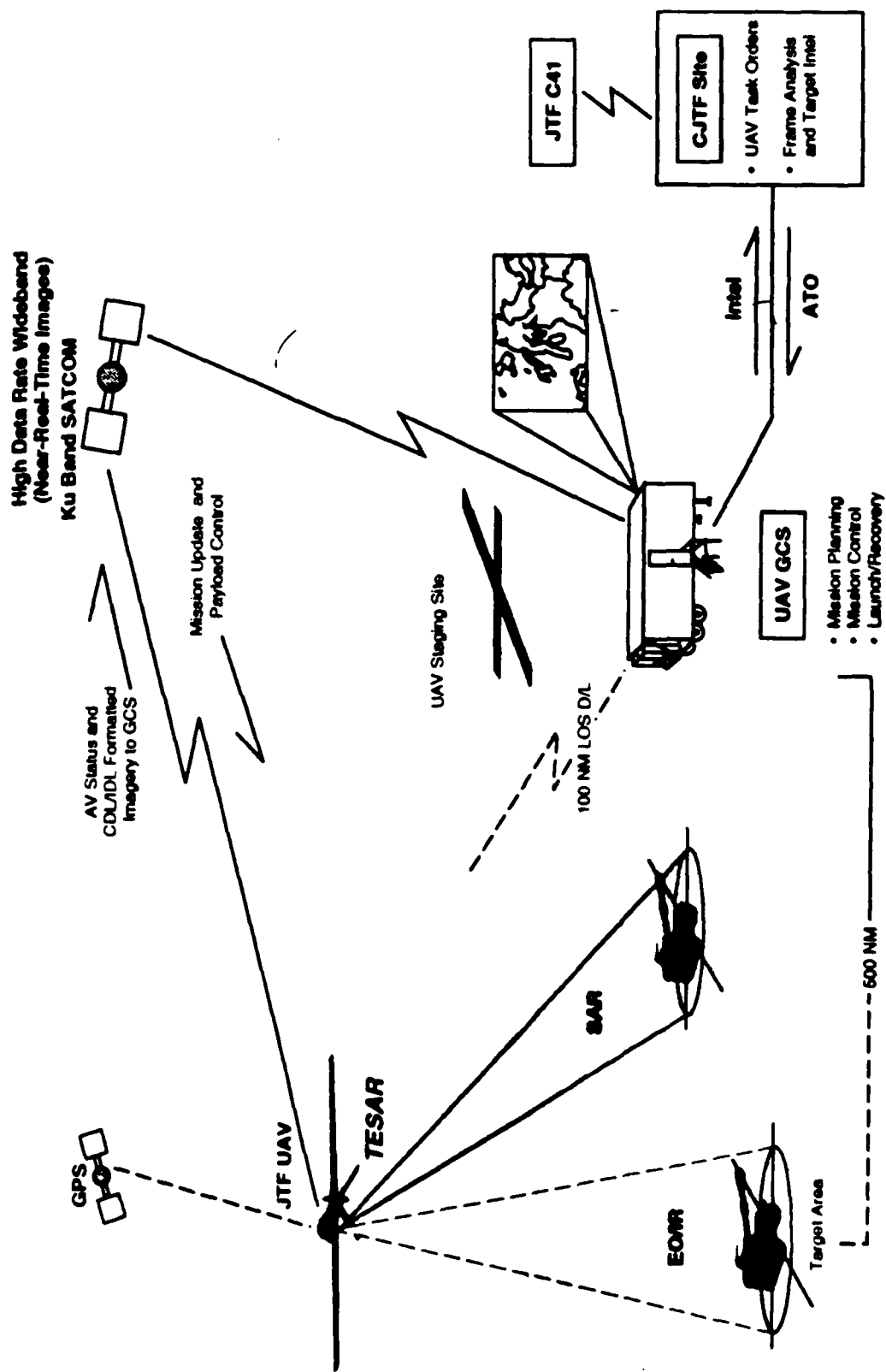
OTHER ACTIVITIES

- **JOINT PRECISION STRIKE DEMONSTRATION (JPSD)**
- **TACTICAL ENDURANCE SYNTHETIC APERATURE
RADAR (TESAR)**



JPSD Program Schedule





PM TESAR

Tactical Endurance Unmanned Aerial Vehicle Synthetic Aperture Radar Subsystem

- **DoD Joint Project Office for Unmanned Aerial Vehicles has Contracted General Atomics to Develop a:**
 - **Long Range Endurance UAV System**
 - **Capable of Flying 500 Nautical Miles**
 - **Equipped With Electro-Optical/Infrared Sensor System and Remaining on Station for Extended Periods**
- **Key Element of This System Will be the Integration of a Synthetic Aperture Radar (SAR) SubSystem with Fine Resolution at 15,000 ft AGL**
- **Prospective SAR Subsystem Contractor Will be Responsible for Building:**
 - **10 UAV SAR Subsystem Payloads**
 - **3 Sets of Ground Control Elements**
 - **In Support of an Advanced Concept Technology Demonstration**
- **SAR Subsystem Deliveries Will Begin 16 Months After Contract Award With the Goal of Full Integration in the UAV System by 24 Months**

Points of Contact for Business Related Information

**JPSD: Mr. Pellien
 (703) 756-5720**

**STINGRAY: Mr. Chris Keller
 (908) 544-5456**

**TESAR: LTC Horner
 (908) 544 5816**

NOTES



CECOM RDEC

**Night Vision and Electronic Sensors
Directorate**



APBI "CECOM Sensor Advanced Technology Demonstrations"

**AN OVERVIEW OF CURRENT
ADVANCED TECHNOLOGY DEMONSTRATIONS**

**MR. LARRY L. FILLIAN
ASSOCIATE DIRECTOR, OPERATIONS**

POINT PAPER

SUBJECT: An Overview of Current Advanced Technology Demonstrations

OBJECTIVE: Provide a review of the current Advanced Technology Demonstrations for Night Vision and Electronic Sensors Directorate

FACTS:

- Night Vision has the mission to execute 10 of the Army's 28 ATDs, and provides key technology underpinnings to 9 of the remaining 18 ATDs. Sensor technology is provided to five of the seven DoD Thrusts.
- The current Advanced Technology Demonstrations for Night Vision and Electronic Sensors Directorate include Remote Sentry, Scout Sensor Suite, Advanced Image Intensification, Multi-Sensor Aided Targeting - Air, Radar Deception & Jamming, Bistatic Radar, Target Acquisition, Close-In Man Portable Mine Detector, and Off-Route Smart Mine Clearance.
- The technology trends range from the individual sensor to sensor suites and include implementation of sensor fusion; process requirements will escalate as part of sensor suite implementation; interfaces for information transport will be established.

BRIEFER: Mr. Larry L. Fillian
Associate Director, Operations
ATTN: AMSEL RD NV
COMM: 703-704-1143

ACTION OFFICER
THOMAS T. STECK
Resource Management Division
COMM: 703-704-1188

NVEDS'S TECHNOLOGY INSERTION TO ARMY/OSD ATD's AND S & T THRUST's

- **MISSION RESPONSIBILITY TO EXECUTE 10 OF THE
ARMY'S 28 ATD's**
- **PROVIDE KEY TECHNOLOGY UNDERPINNINGS TO 9
OF THE REMAINING 18 ATD's**
- **PROVIDE SENSOR TECHNOLOGY INSERTION TO 5 FO
THE 7 DOD SCIENCE AND TECHNOLOGY THRUST's**

NVEDS INTEGRATED ADVANCED TECHNOLOGY DEMONSTRATION STRATEGY

- **PROVIDE THE SENSORS AND SENSOR SUITES REQUIRED TO MEET THE ARMY'S OVERALL OPERATIONAL REQUIREMENTS IN THE “***DIGITIZED BATTLEFIELD***”**
- **HORIZONTAL INTEGRATION OF TECHNOLOGY CONCEPTS (COST/LOGISTICS/UNIFORMITY)**
- **ESTABLISH AN INTEGRATED USER/DEVELOPER AND INDUSTRY TEAM EARLY IN THE ATD PROCESS TO INSURE OBJECTIVES/GOALS ARE COMMON AND WELL DEFINED**
- **DEMONSTRATE PROTOTYPE HARDWARE WITH THE USER IN AN OPERATIONAL ENVIRONMENT TO ESTABLISH A RAPID TECHNOLOGY TRANSITION PATH TO THE SOLDIER**

ADVANCED TECHNOLOGY DEMONSTRATOR's - NVESD LEAD

- REMOTE SENTRY

- SCOUT SENSOR SUITE

- ADVANCED I² (AI²)

- MULTI-SENSOR AIDED TARGETING (MSAT) - AIR

- RADAR DECEPTION & JAMMING (RD & J)

- BISTATIC RADAR FOR WEAPONS LOCATION

- TARGET ACQUISITION

- CLOSE-IN-MAN PORTABLE MINE DETECTOR

- OFF ROUTE SMART MINE CLEARANCE

TECHNOLOGY INSERTION TO OTHER ARMY ATD's

NVESD PROGRAM

ATD

ADV HELICOPTER PILOTAGE SUITE ———> ROTORCRAFT PILOT's ASSOCIATE (RPA)

2nd GEN FLIR/MMW TECH ———> BATTLEFIELD COMBAT IDENTIFICATION (BCID)

OVERALL SENSOR SUITES ———> COMBINED ARMS COMMAND & CONTROL (CAC2)

ENHANCED GROUND SURV SENSORS ———> HIT AVOIDANCE

SEEKER SENSORS (FPA's) ———> ENHANCED FOG-M

2nd GEN FLIR/ATR ———> HUNTER VEHICLE

INTEGRATED SIGHT MODULES/ HELMET DISPLAYS ———> GEN II SOLDIER

NIGHT ON BDS-D SIMULATIONS ———> BATTLEFIELD DISTRIBUTED SIMULATION - DEVELOPMENTAL (BDS-D)

SENSOR SUITES (EO/MMW/SAR) ———> JOINT PRECISION STRIKE DEMONSTRATION (JPSD)

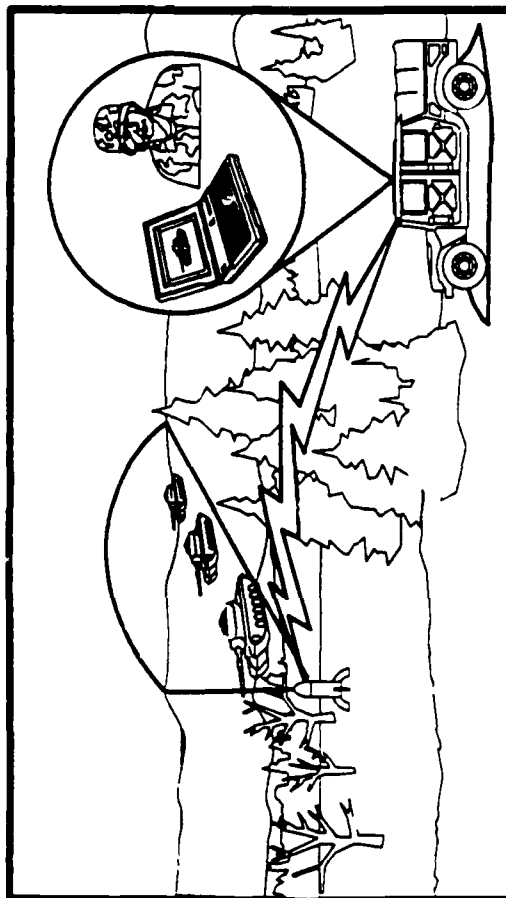
REMOTE SENTRY ATD

Objective:

Demonstrate Unattended, Remotely Operated, Wide Area Ground-Based Surveillance and Target Acquisition During Day/Night, Limited Visibility Conditions.

Justification:

- Key ATD in Support of Thrust 5 RFPI
- Extends the Advanced Scout's Range and Area of Surveillance
- Increased Forward Scout/Observer Survivability Through Battlefield Awareness
- Remotely Controlled, Interoperable Sentries Reduce Field of Regard "Blind Spots"



Program Schedule

Milestones	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Model/SIM RFS							
Contract Award							
Design HOWE							
Early Field Demo							
Equip FAB & Test							
Delivery							
RS ATD Demo							
Demo W/SS ATD							
Deliv to RFPI							
RFPI TLD							

Approach:

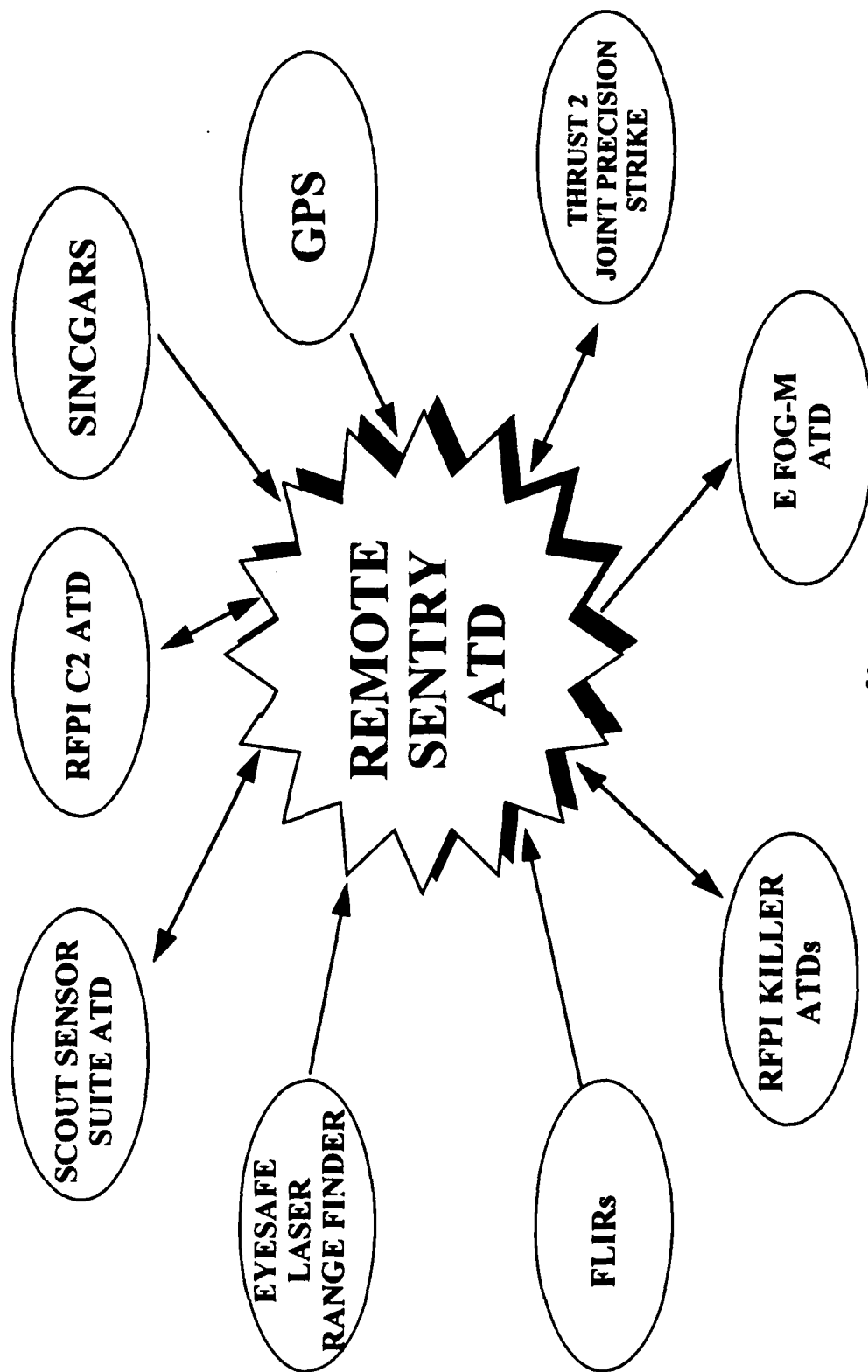
Utilize State-of-the-Art Affordable, Light Weight Sensors with Data Compression and Image Transfer to Produce a Remote Area Surveillance and Recon System in an Operational Configuration to Be Tested and Demonstrated in an Operational Scenario.

Applications:

- ALC Scout Perimeter Surveillance
- (Single and Multiple) Remote Wide Area Surveillance
- Target Acquisition
- Battlefield Damage Assessment

REMOTE SENTRY ATD

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



SCOUT SENSOR SUITE ATD

Objective:

Demonstrate an Advanced Long Range Sensor Suite with ATR, Image Compression and Secure Communication Capabilities, Providing Multiple Target Acquisition and Enhanced Targeting Handoff for Advanced Scout Vehicles

Justification:

- Provides Long Range Acquisition for Target Designation and Prioritization
- Increases Survivability Through See-First/Shoot-First Capability
- Improves Lethality by Enabling Indirect Fire Through Standoff Weapons and Battle Damage Assessment

Acquisition:

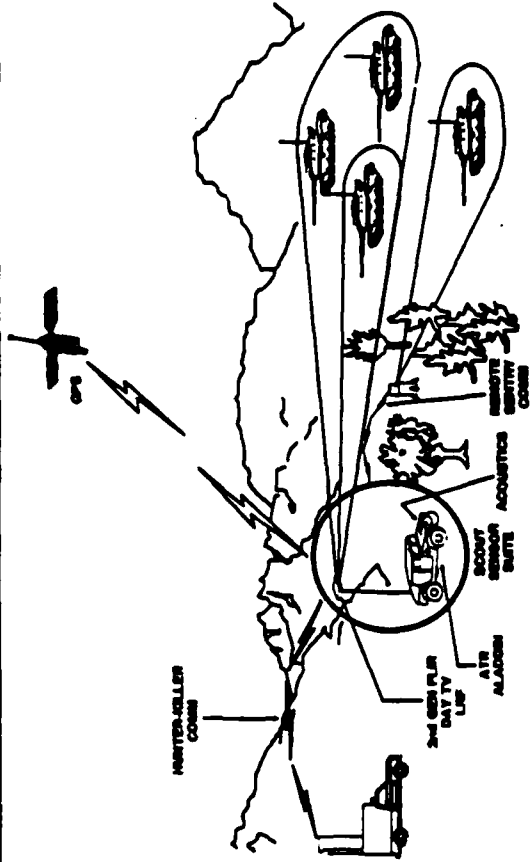
- IEW (PM - NVEO)
- ASM (Candidate)

Proponent

- Dismounted Battle Lab
- Mounted Battle Lab

Program Schedule

Milestone	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Modeling & Simulation							
Mat Study							
Weighting Field Exp(s)							
RFP1 Early Version Demos							
Award							
Sensors Acq/Pkg/Integ							
Demo Mat Mounted Suite							
Algorithm Modification/Processor Integration							
Image Comp/Transfer Impl							
Integ/Demo Total Suite on Hunter Vehicle							
RFP1 TLD							



Approach

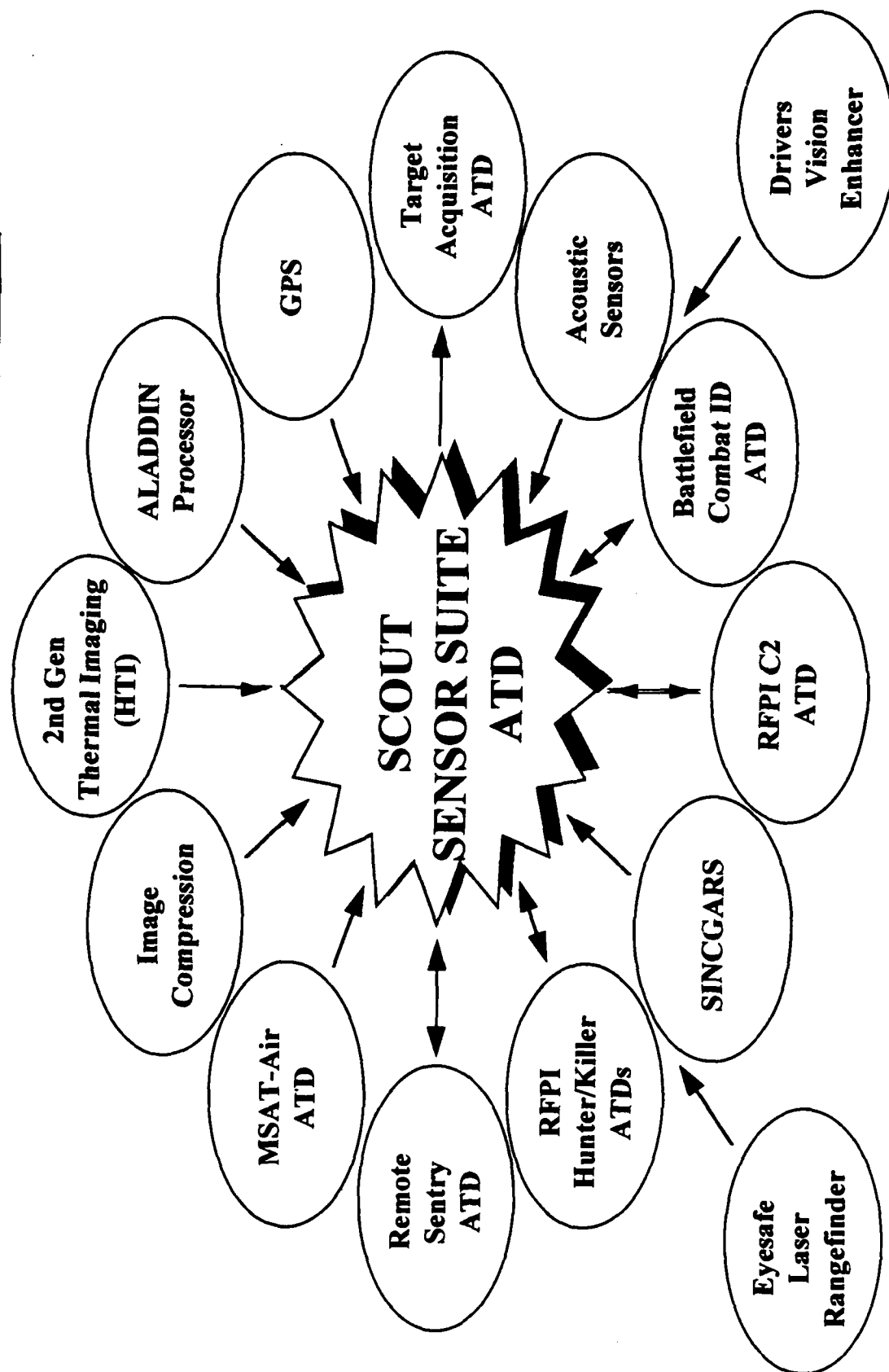
- Utilize 2nd Generation Thermal Imaging, Day TV and Acoustic Cueing Sensor Technology for Long Range Target Acquisition
- Integrate Modified Modular ATR Algorithms into a High Density Integrated Processor for Rapid Multiple Target Acquisition
- Combine High Accuracy Position/Location Sensors and Image Compression Techniques with Secure Communications to Handoff Precision Targeting Information
- Demonstrate Suite as a Part of the DoD S&T Thrust 5 (ALC), Rapid Force Projection Initiative TLD

Application:

- Hunter Vehicle ATD
- Future Scout Vehicle

SCOUT SENSOR SUITE ATD

RELATIONSHIPS TO OTHER PROGRAMS/ATDs



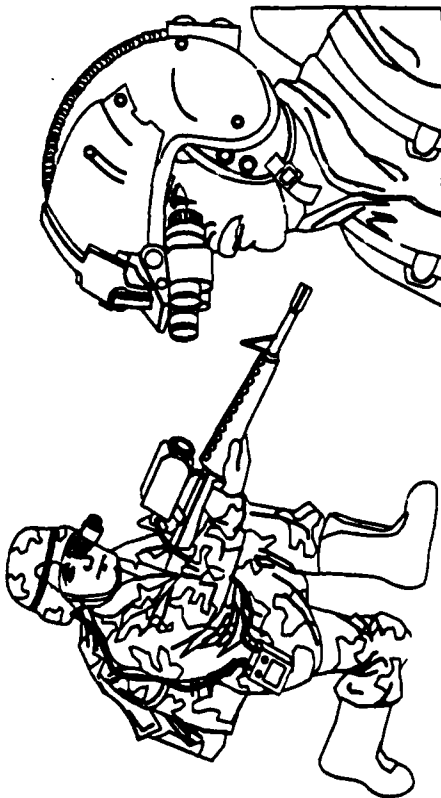
ADVANCED IMAGE INTENSIFICATION (AI²) ADVANCED TECHNOLOGY DEMONSTRATION

OBJECTIVE:

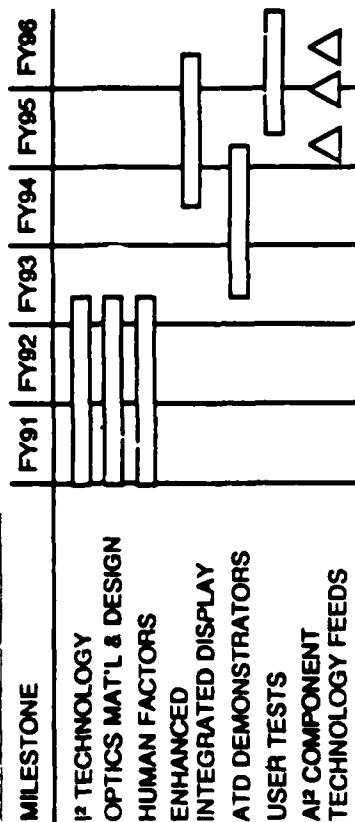
- DEMONSTRATE ADVANCED NIGHT VISION GOGGLES USING IMAGE INTENSIFIERS, WHICH ENHANCE OPERATIONAL EFFECTIVENESS AND REDUCE WORKLOAD FOR DISMOUNTED, AVIATION AND CS/CSS APPLICATIONS

JUSTIFICATION:

- ADVANCED P² PROVIDES SIGNIFICANTLY ENHANCED OPERATIONAL EFFECTIVENESS BY IMPROVING THE MOBILITY AND VERSATILITY OF THE DISMOUNTED SOLDIER AND CARGO, UTILITY AND SOF AIRCRAFT AS WELL AS THE COMBAT SUPPORT/ COMBAT SERVICE SUPPORT SOLDIER
- IMPROVED ARMY'S CAPABILITY TO FLY AND FIGHT AT NIGHT REMAINS A TOP USER PRIORITY



SCHEDULE AND FUNDING:



APPROACH:

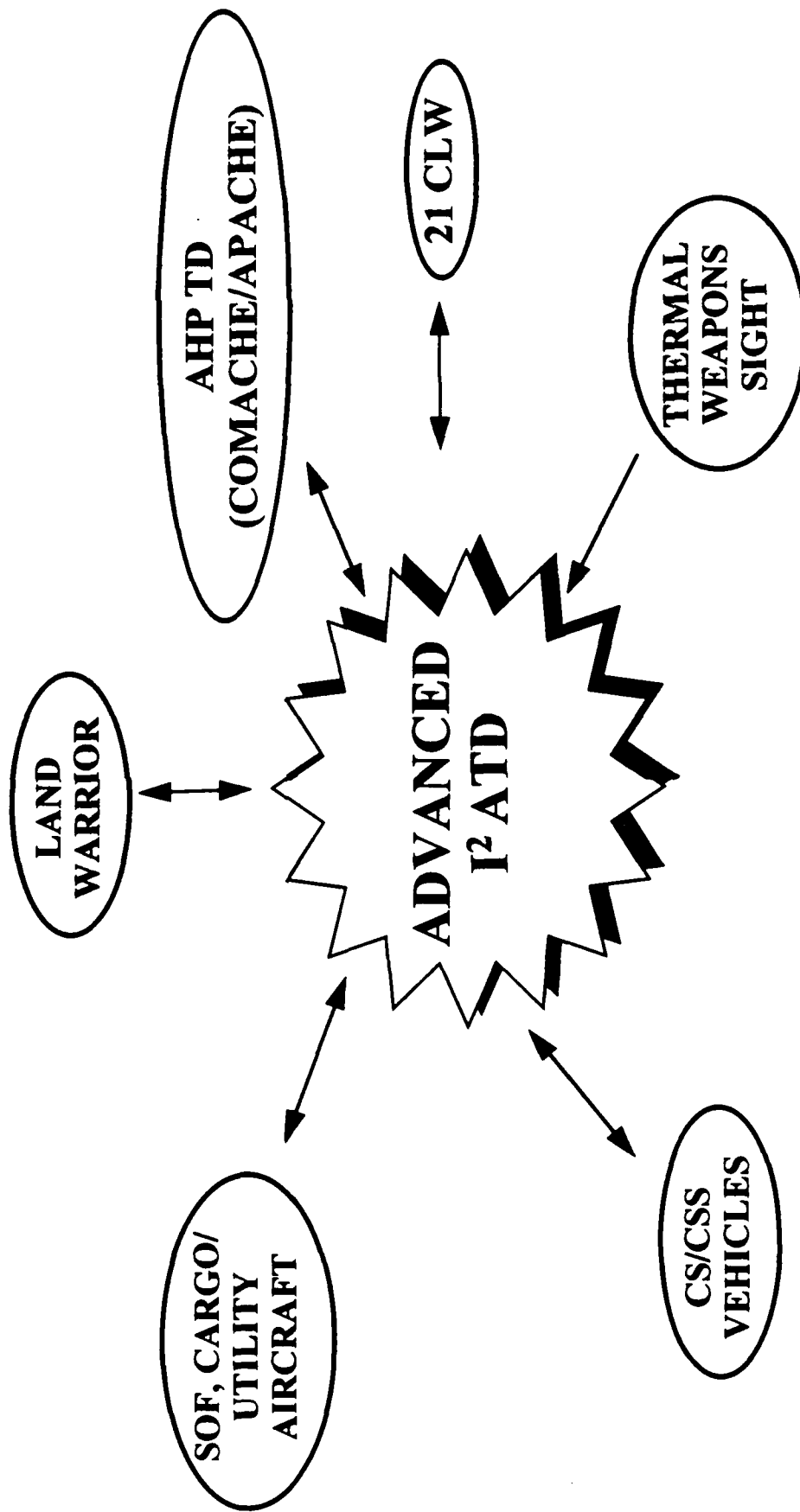
- INCORPORATE "LESSONS LEARNED" FROM FIELD EXPERIENCE
- EXPLOIT RECENT TECHNOLOGY ADVANCES TO
 - INCREASE VISUAL ACUITY BY ~50% IN LOW LIGHT
 - INCREASE FOV (DOUBLE AREA OF COVERAGE)
 - INTEGRATE FLIGHT SYMBOLLOGY & SCENE DISPLAY
 - IMPROVE HUMAN FACTORS

APPLICATIONS:

- DISMOUNTED (TEISS BASIC, 21CLW)
- AVIATION (SOF, CARGO, UTILITY & CURRENT SCOUT)
- CS/CSS

ADVANCED I² ATD (AI²)

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



MULTI-SENSOR AIDED TARGETING FOR AIR (MSAT-AIR) ATD

Objective:

- Demonstrate the Economical Fusion of Multiple Sensors in an Airborne, Automated Target Acquisition Suite

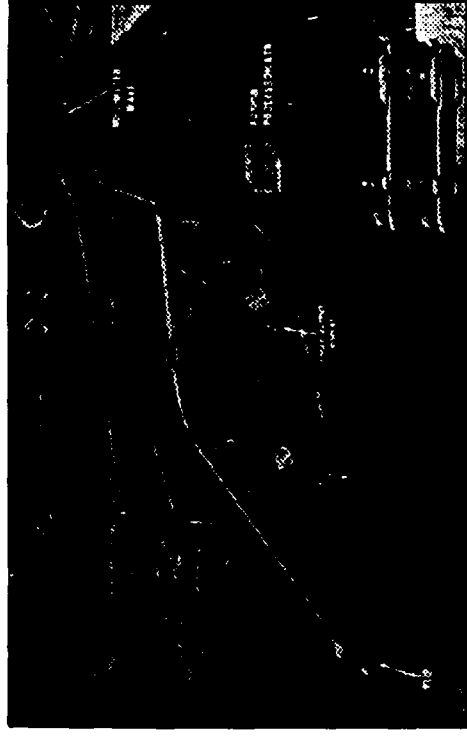
Justification:

- Ability to Rapidly Acquire Targets at Extended Ranges in Day, Night and Adverse Weather
- Increased Lethality
- Increased Survivability from Shorter Search Times

Proponent:

Acquisition: Aviation PEO

- Comanche TSM
- Mounted BL



MSAT-Air Detailed Schedule

	FY92	FY93	FY94	FY95	FY96
Software					
Algorithm Evaluation					
Shop Processor					
Air Processor					
Integration					
Demonstration					
Tech Data Package					
Reviews					
ICWGS					

Approach:

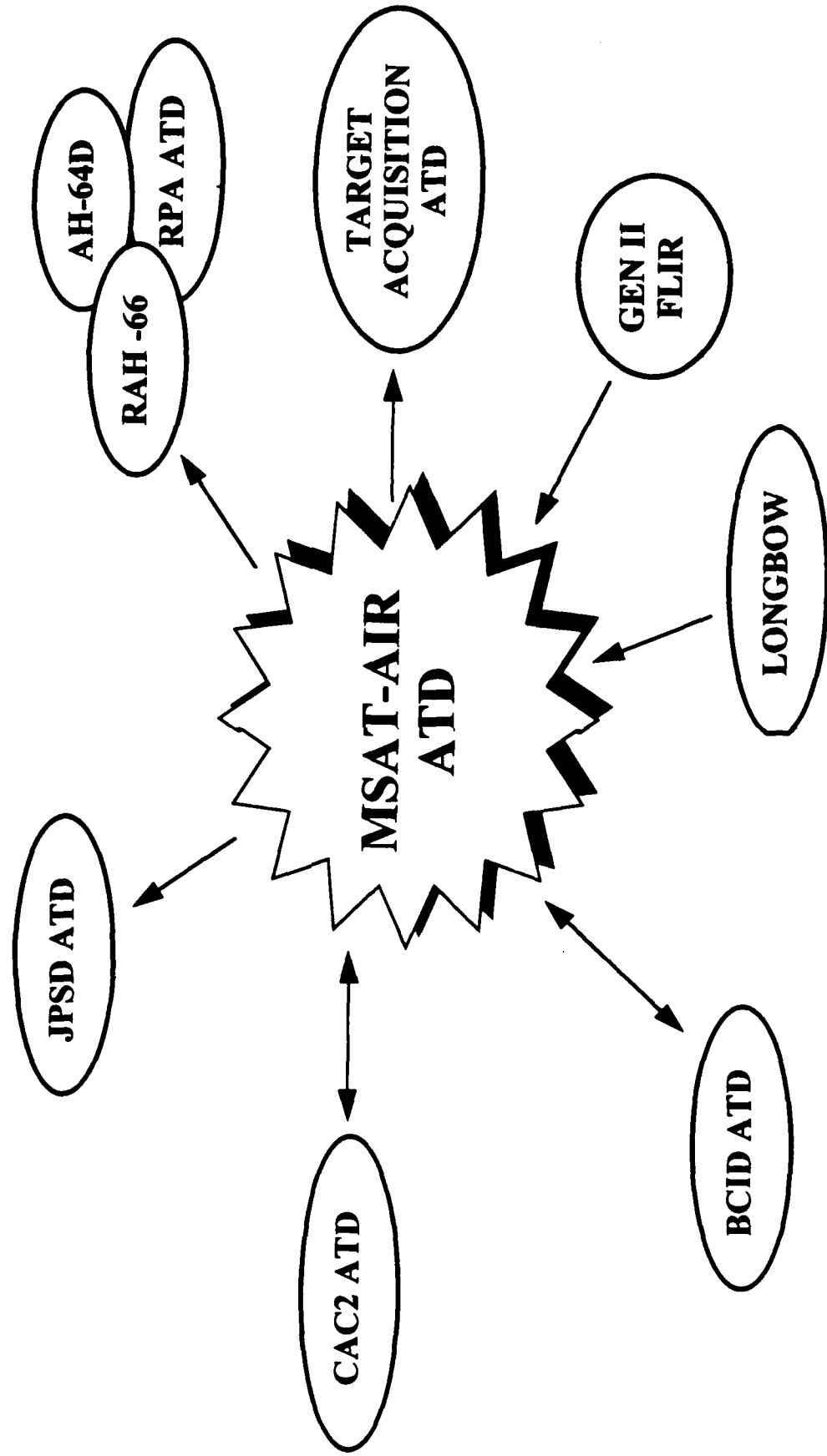
- Demonstration of FLIR/MMW Sensor Fusion in an Operational Environment:
 - 2nd Gen FLIR/Longbow MMW Radar
 - Feature-Level Fusion Algorithms
 - Real-Time Processing
 - Man-in-the-Loop Evaluation

Applications:

- RAH-66 Comanche
- AH-64 Longbow Apache
- Joint Precision Strike, Thrust 2
- Advanced Land Combat (ALC)

MSAT-AIR

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



RADAR DECEPTION AND JAMMING (RD&J) ATD

Objective:

- Demonstrate Airborne Multifunctional System Which Will:
 - Detect, Identify, and Locate Ground and Airborne RF Emitters
 - Provide Real-Time Threat Awareness and Optimization of Countermeasure Selection

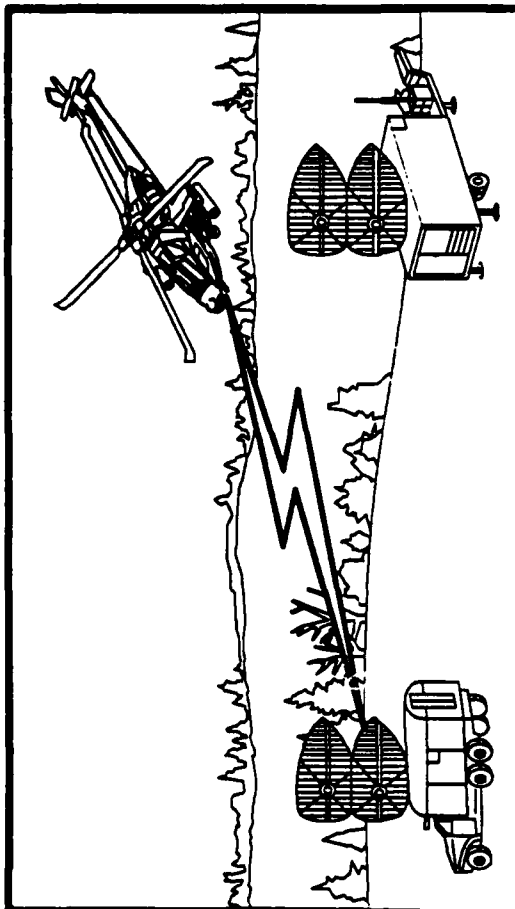
Justification:

- Army IEW Master Plan (AIMP) Requirement for Suppression of Enemy Air Defense (SEAD) Jammer.
- Aviation Mod Plan-Survivability of Comanche, Apache, and Special Electronic Mission Aircraft (SEMA)
- TRADOC Requirement for IFF and Targeting Assist

Battlelab:

Peo: Aviation (PM-AEC)

- Mounted Battlespace
- Depth & Simultaneous Attack
- Early Entry



Approach:

- Integration of Next Generation ASE with Avionics
- Develop Expert Power Managed ECM System
- Provide Consolidated Emitter Report for Target Acquisition System (TAS) and Real-Time Situational Awareness Display
- Flight Test in Realistic Environment
- Determine Value of Integrated Technologies

Applications:

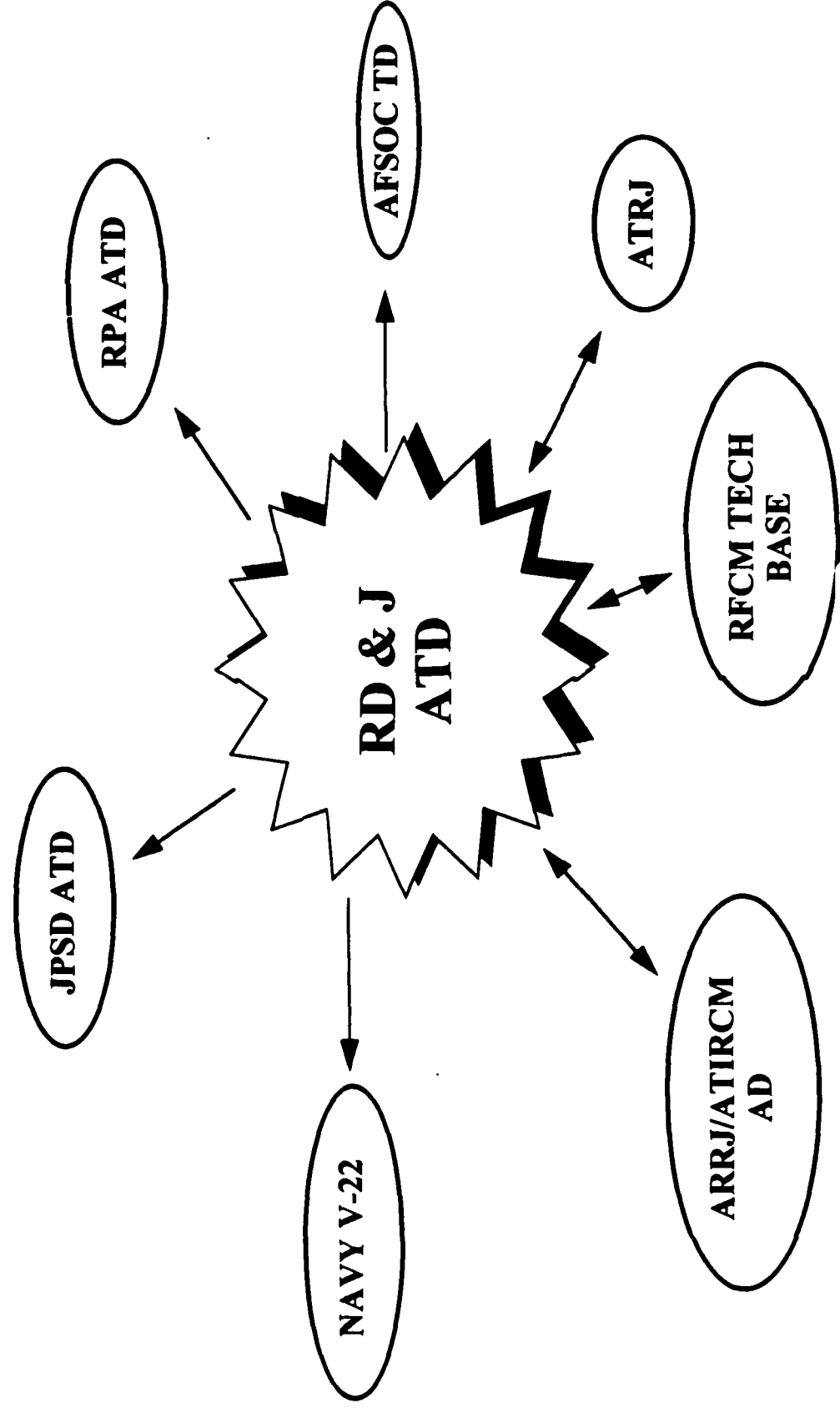
- Rotocraft Pilot Associate ATD
- Comanche
- Apache
- Special Electronic Mission Aircraft (SEMA)
- Special Operations Aircraft
- Joint Precision Strike

Schedule

Milestone	FY92	FY93	FY94	FY95
ECM Modulator Dev				
AF EWES & ECM Tests	Completed in 91			
ATRJ Option Award	▲			
Issue Integration Contract	▲			
System Design/FAB				
System Integration				
Aircraft Installation				
FLT Tests/Demo/Rep				
Trans to RPA/ PM-AEC/JPSP				Δ

RADAR DECEPTION & JAMMING ATD

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



BISTATIC RADAR FOR WEAPONS LOCATION ATD

Objective:

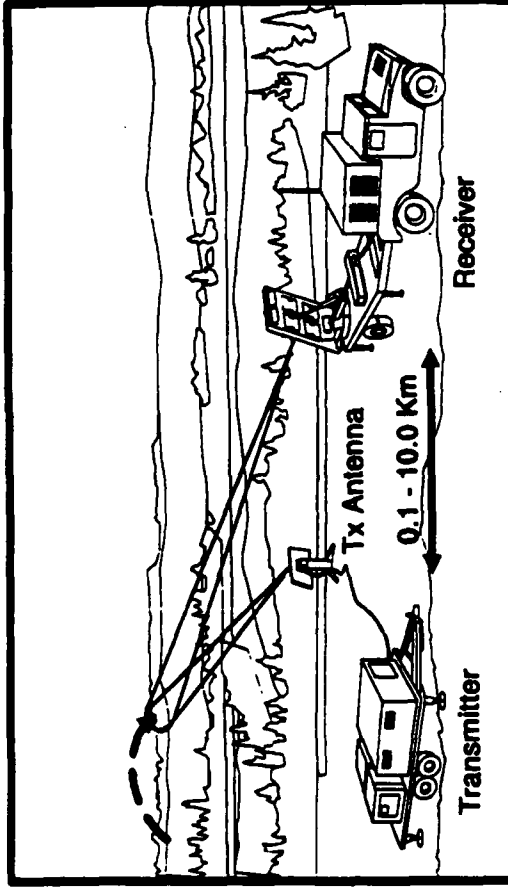
Demonstrate, a Survivable, Affordable, 3-D Bistatic Radar which can Detect and Track Small Targets with Range and Accuracy Consistent with Current and Future Requirements.

Justification:

- Need for Survivable Radar in the Face of Increasing Anti-Radiation Missile (ARM) and Other Indirect Fire Threat
- Requirement to Protect the Force
- Need for Real Time Targeting

Proponent: Depth and Simultaneous Attack Battlelab

Acquisition: PEO IEW (PM FIREFINDER)



Schedule

	FY92	FY93	FY94	FY95	FY96
Design Studies	■				
Contract Award	▲				
Final Design	■	■			
Construct Demonstrator		■	■		
Tests / Demos			■	■	
Data Analysis				■	■
Final Report					▲

Approach:

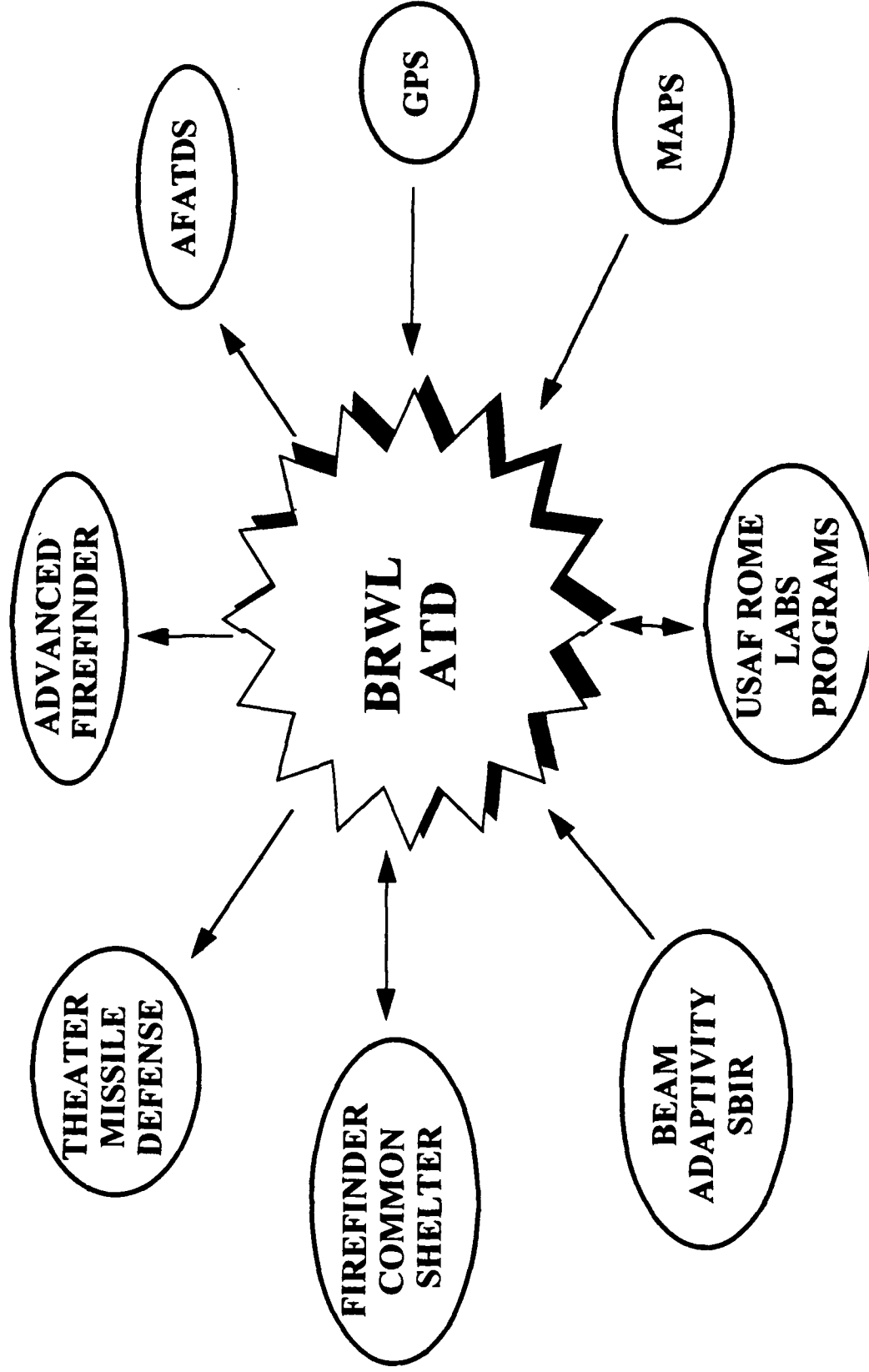
- Evaluate Candidate Technologies, Techniques, and System Architectures Including Transmitter-Receiver Synchronization Techniques, Illumination Schemes, Beamforming Options and Pulse Chasing
- Design/Develop Modular, Multi-Beam Pulse Chasing Receiver Incorporating Multiple Redundant Synchronization Techniques
- Design/Develop Modular Transmitter with Remote Expandable Electronically Scanned Antenna

Applications:

- Enhanced FIREFINDER
- Technology has Application to Air Defense

BI-STATIC RADAR FOR WEAPONS LOCATION (BRWL) ATD

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



SUMMARY/TRENDS

- **ESTABLISHING INTERFACES FOR INFORMATION TRANSPORT**
- **INDIVIDUAL SENSOR TO A SENSOR SUITE IMPLEMENTATION WITH SENSOR FUSION**
- **RECOGNITION OF PROCESSOR REQUIREMENTS ESCALATION AS PART OF SENSOR SUITE IMPLEMENTATION**

NOTES



SESSION I

TECHNOLOGY UNDERPINNINGS FOR CURRENT AND FUTURE ADVANCED TECHNOLOGY DEMONSTRATIONS



CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



ADVANCED OPTICS AND DISPLAY TECHNOLOGY

**MR. WAYNE T. GRANT
DIRECTOR, LASER AND PHOTONICS DIVISION**

POINT PAPER

SUBJECT: Advance Planning Brief for Industry (APBI), 1994

OBJECTIVE: Provide industry with upcoming business opportunities within the Night Vision and Electronic Sensors Directorate in area of ADVANCED OPTICS AND DISPLAY TECHNOLOGY.

FACTS: • Head Mounted Vision Systems (HMVS) are required for Soldier (21 CLW), Armor (Mounted Warrior), and Aviation (Comanche/AHP) applications.

- HMVS require significant advances in the state-of-art for optics, display, and drive/read electronics to provide soldier with equivalent image quality to that of existing direct view systems.

- NVESD is responsible for developing and integrating the critical components; sensor, display (exploit ARPA development program), electronics, and optics; into a HMVS.

- NVESD will use a BAA (FEB. 94 solicitation) to contract with industry in advancing the technology underpinnings for HMVS.

- NVESD plans to award a contract in FY95 to develop HMVS hardware for a field demonstration in FY98.

BRIEFER: Mr. Wayne Grant
Director, Lasers and Photonics Division
ATTN.: AMSEL-RD-NV-L
COMM.: 703-704-1686

ACTION OFFICER
THOMAS STECK
Resource Management Division
COMM.: 703-704-1188

ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

OBJECTIVE

Develop core technologies for HMVS to accommodate current and future developmental systems at NVESD

Maximize dual use technology and component level commonality to reduce costs

JUSTIFICATION

HMVS are planned for both Mounted and Dismounted Soldier, by the 21st Century;
common display/optics technology for HMVS will reduce development, production, and logistics costs.

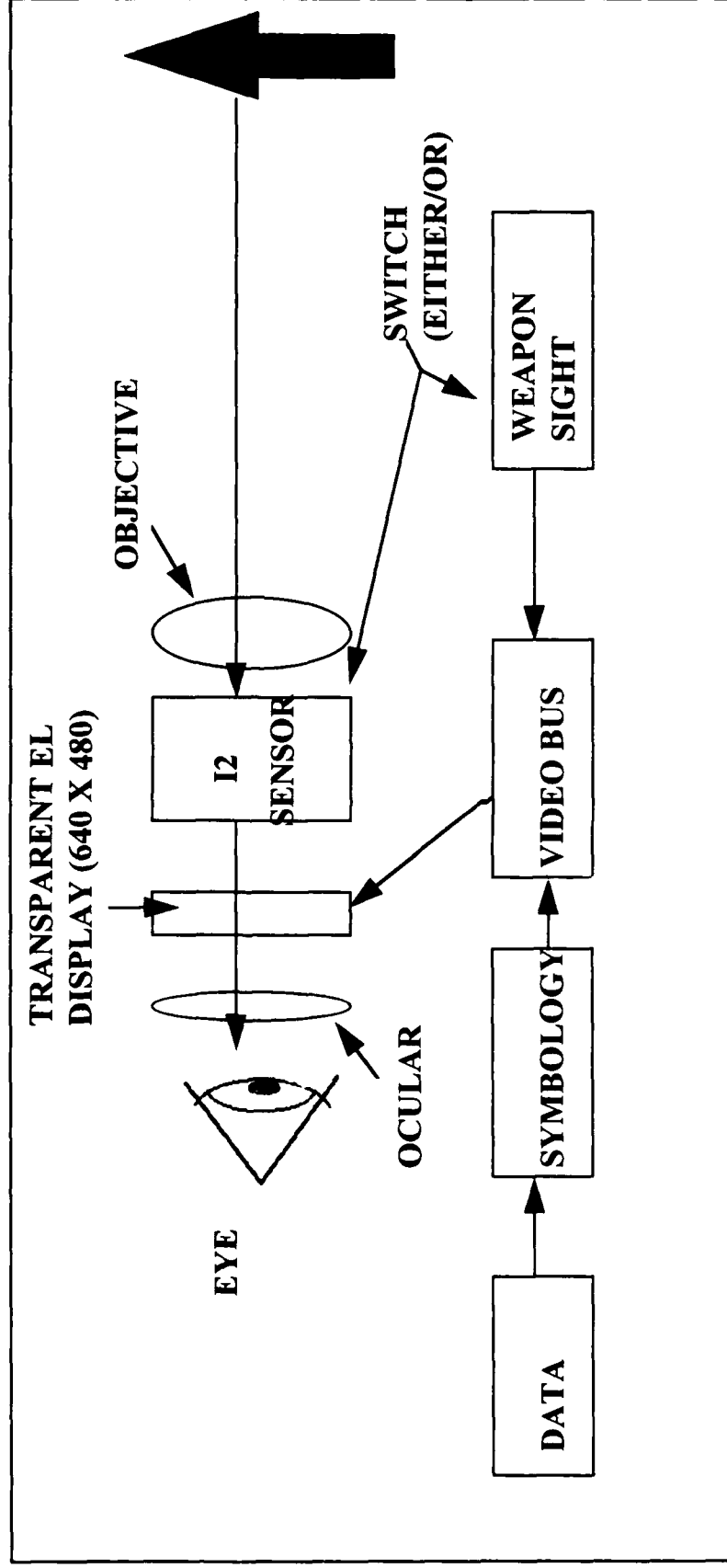
PROPONENT

INFANTRY - AVIATION - ARMOR

ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

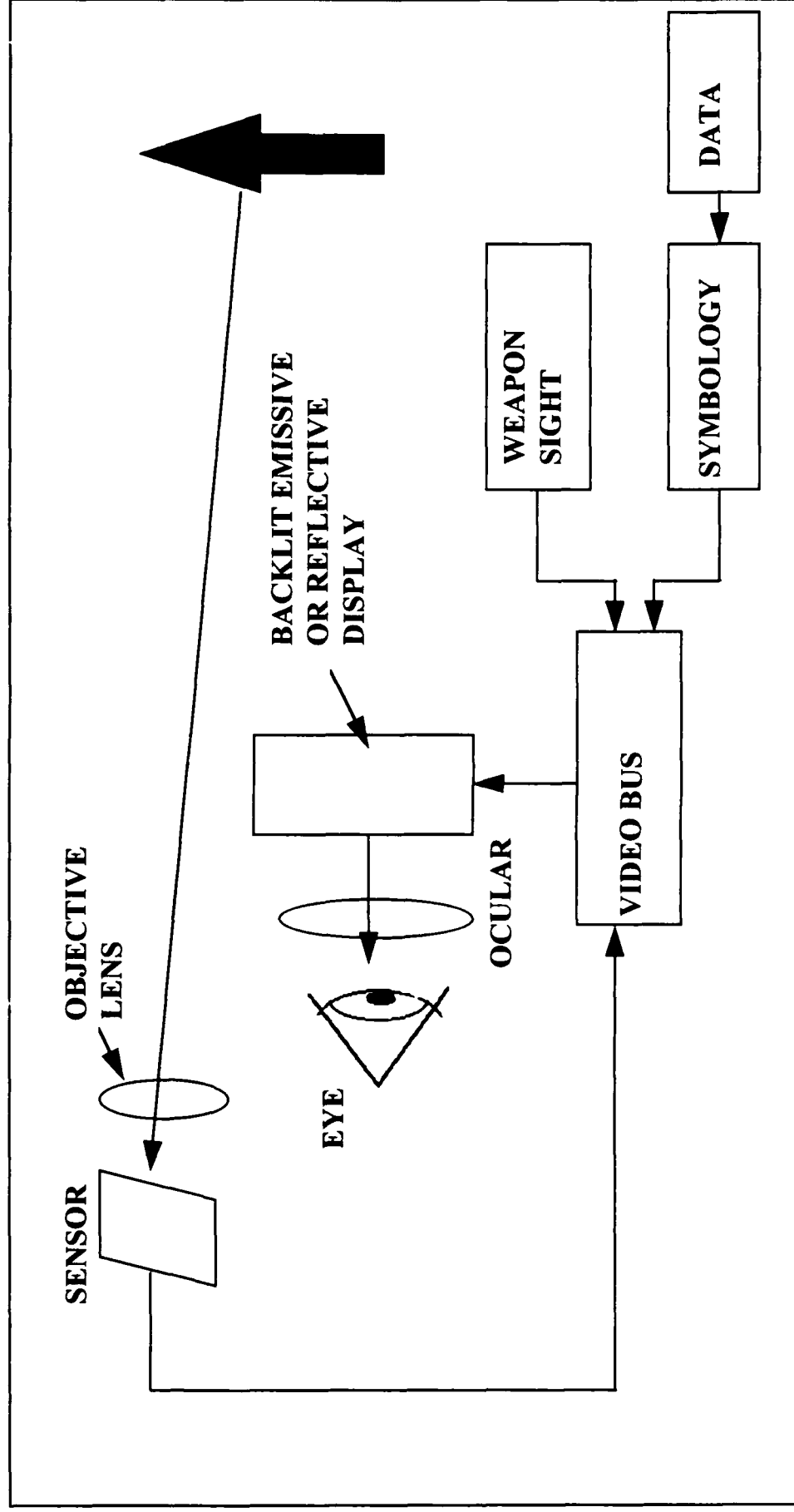
CONFIGURATION: DIRECT VIEW HMVS, SELECTABLE/OCCLUDED
(AI2/LAND WARRIOR)



ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

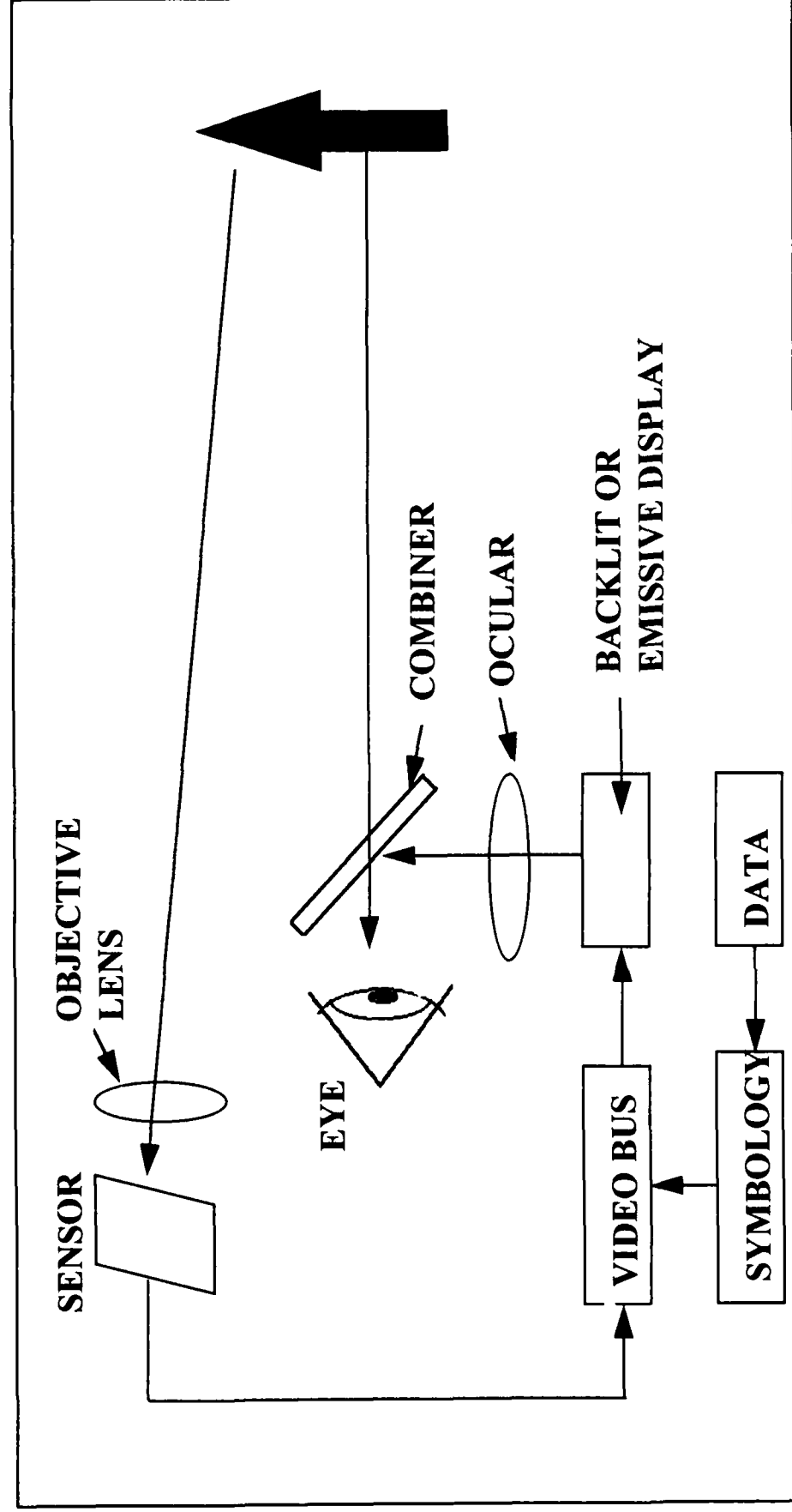
CONFIGURATION: ELECTRONIC COUPLED HMVS
(21 CLW & MOUNTED WARRIOR)



ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

CONFIGURATION: SEE-THRU, ELECT. COUPLED HMVS (COMANCHE/AHP)



ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

APPROACH

I. DEVELOP TECHNOLOGY UNDERPINNINGS

- A. Models for Display types and “scene to sense” performance**
- B. Evaluation of state-of-art display technology for horizontal integration across all HMVS Applications**
- C. Development of RO/DRIVE electronics and interface architecture**
- D. Development of advanced designs for objective and ocular optics**

II. PROTOTYPE HMVS

- A. Fully develop critical components**
- B. Fabricate prototype system**
- C. Evaluate with user in field environment**

ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

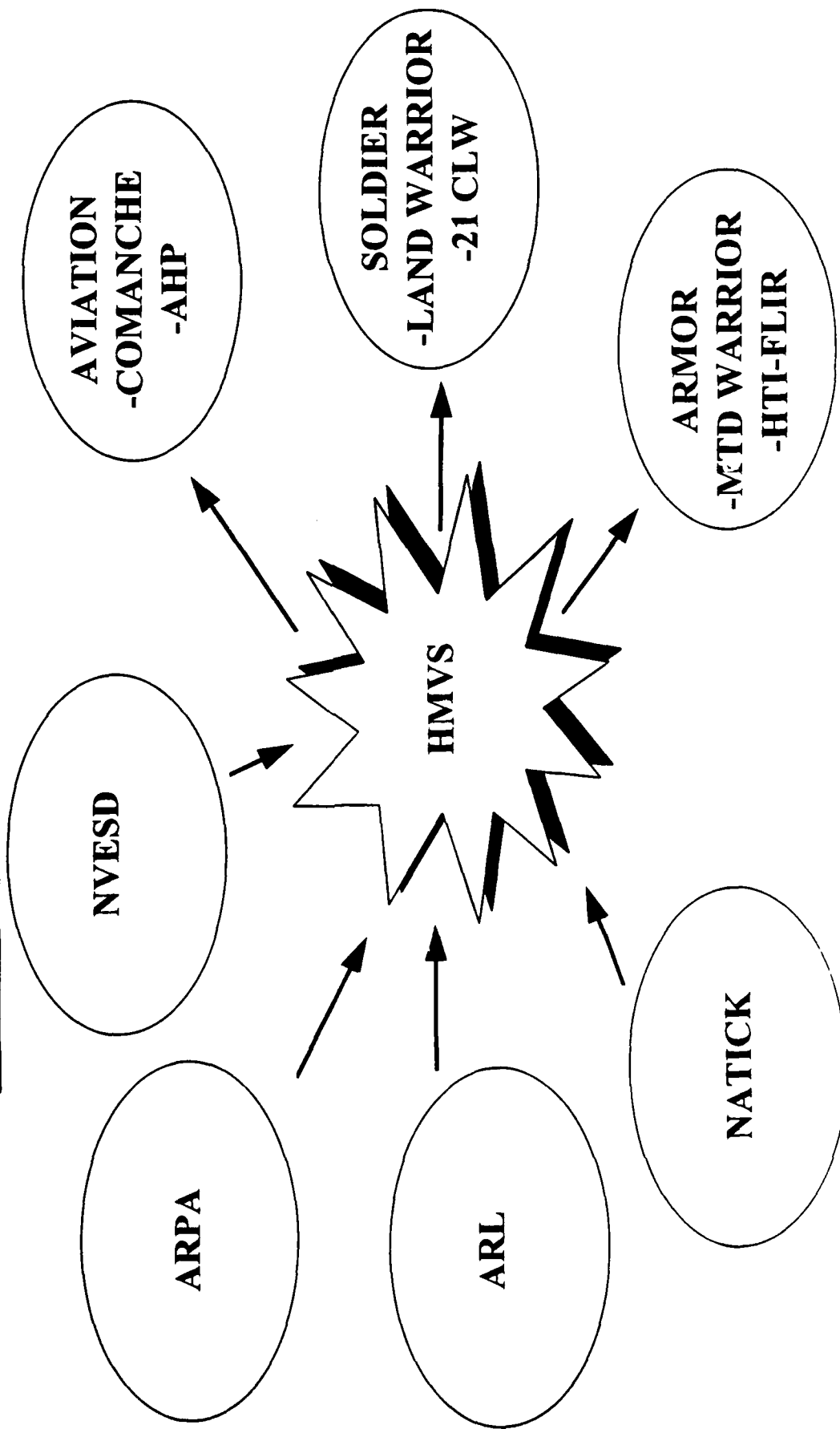
EXIT CRITERIA

BASELINE	EXIT CRITERIA
NO SYMBOLOGY	SYMBOLOGY
NO INDEPENDENT DISPLAY	2000 x 2000 SENSOR & DISPLAY
40 DEGREE FOV	60 DEGREE FOV
.82 cy/mr RESOLUTION	.90 cy/mr RESOLUTION
NO IMAGE TRANSFER	IMAGE TRANSFER CAPABILITY (import and export)
20mm EYE RELIEF (10 mm exit pupil)	35mm EYE RELIEF (10mm exit pupil)

ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

RELATIONSHIPS TO OTHER PROGRAMS



ADVANCED OPTICS AND DISPLAY TECHNOLOGY

HEAD MOUNTED VISION SYSTEM

TRANSITION PLAN

- TO 21ST CENTURY LAND WARRIOR (21 CLW) DEVELOPMENT
IN FY 99
- TECHNOLOGY "FALLOUT" TO:
 - ADVANCED IMAGE INTENSIFIER-ATD (AI2-ATD)
 - LAND WARRIOR PLATFORM
 - MOUNTED WARRIOR PROGRAM
 - COMANCHE
 - ADVANCED HELICOPTER PILOTAGE (AHP)
 - HORIZONTAL TECHNOLOGY INTEGRATION - FLIR (HTI-FLIR)



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Head Mounted Vision System (HMVS) Technology

OBJECTIVE: Define and Develop underpinning technology for a soldier HMVS, i.e., 2000 x 2000 pixel image quality. Award multiple contracts to address critical component technologies in areas of sensors, displays, read/drive electronics, and optics.

PROPOSED CONTRACT TYPE: CPFF via BAA

KEY MILESTONES:

Release BAAs: FEBRUARY 94

1. I'MVS and Associated Technology 2. Advanced Optics Technology

Contract Award: 4Q94

Contract Length: 18 months

ESTIMATED VALUE:

\$3 - \$5 M

POC TELEPHONE:

Mr. Bill Markey
703-704-1306



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Head Mounted Vision System (HMVS) Development

OBJECTIVE: Develop selected components, integrate, and demonstrate an HMVS for 21st Century Land Warrior application.

PROPOSED CONTRACT TYPE: CPFF

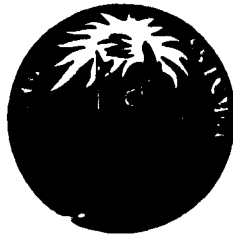
KEY MILESTONES: Contract Award: 2QFY95
Contract Length: Approx. 36 Months
Field Demonstration: 2Q98

ESTIMATED VALUE: \$5 - \$8 M

POC TELEPHONE: Mr. Bill Markey
703-704-1306

All contract actions are dependent upon receipt of FY95 funds.

NOTES



CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



**ADVANCED PROCESSOR DEVELOPMENT
AND
ADVANCED FOCAL PLANE ARRAYS**

**MR. TERRY L. JONES
DIRECTOR, THERMAL TECHNOLOGY AND PRODUCIBILITY DIVISION**

AVESSEL RD-55

January 1994

PLANS PAPER

SUBJECT: Advanced Night Vision and Advanced Processor Developments: Advanced Planning Briefing for Industry - APBL

OBJECTIVE: Provide Industry with Upcoming Business Opportunities Within the Night Vision and Electronics Sensors Technology Area for Advanced Planning

FACTS

Night Vision and Electronic Sensors Developments: NVESD stands to make major improvements in Sensor Technology

NVESD seeks to improve Visual, Thermal, and Electronic Awareness, Automated Target Acquisition, Classification and Tracking, Weapons Development Efforts, and Battle Damage Assessment of future military systems at extended range

Third Generation Sensors will provide the capability to using a common aperture visible to Infrared Sensor Digitization of the Area, and Sensor Networking Technology

BRIEFER: Mr. Terry L. Jones
Acting Director, Thermal Technology and
Productability Division
ATTN: AVESSEL RD-55 EEPD
Com: 702-706-1700
DSN: 636-1700

THOMAS E. STECK
Action Officer
Resource Management Division
Com: 702-706-1700
DSN: 636-1700

ADVANCED FOCAL PLANE ARRAY AND PROCESSOR DEVELOPMENT

OBJECTIVE

- Design and develop a family of miniaturized, high density, high performance image and signal digital processors for advanced military applications
- Demonstrate the feasibility of smart staring infrared focal plane arrays

JUSTIFICATION

- Reduce cost thru a family of processing modules
- Provide rapid automated target acquisition

PROPONENT

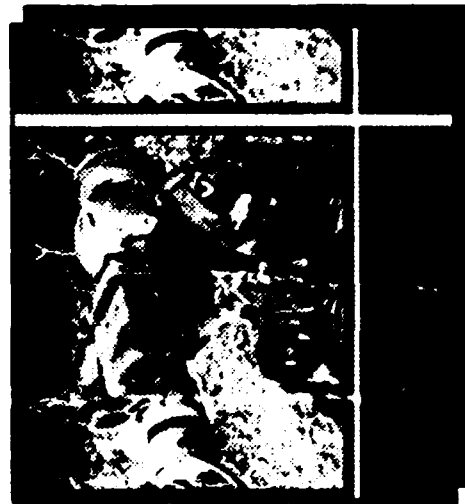
- Tri-Service

Target Acquisition

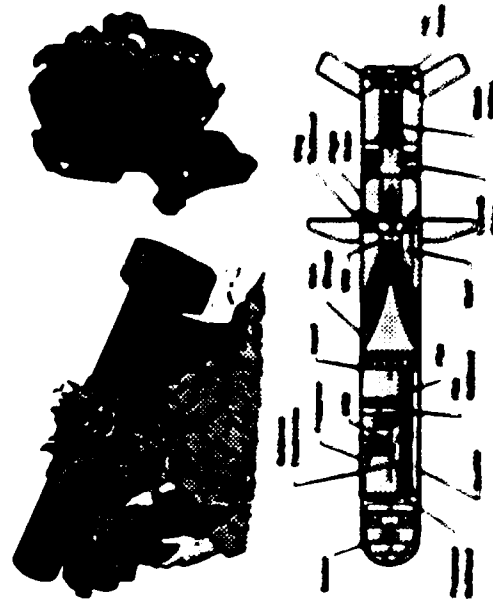
Today Tomorrow Future

Anti-Armor

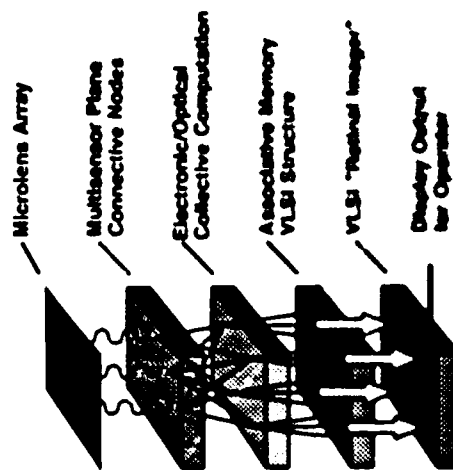
- TOW (1st Gen FLIR)
- DRAGON (1st Gen FLIR)



2nd Gen Fire-and-Forget Missile Seekers



Smart Fire-and-Forget (Lock-on Afterlaunch)



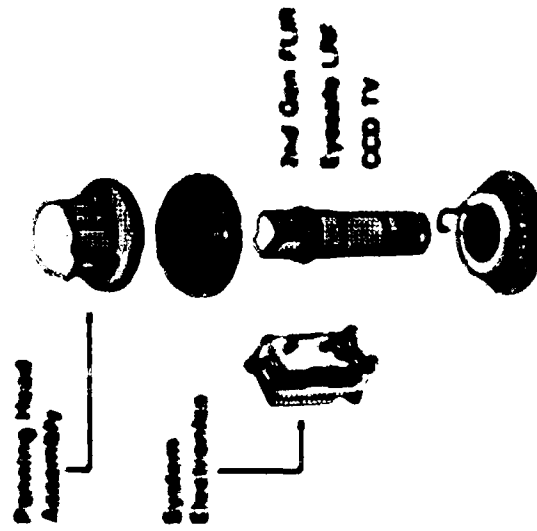
Target Acquisition

Armor

TIS (1st Gen FLIR)

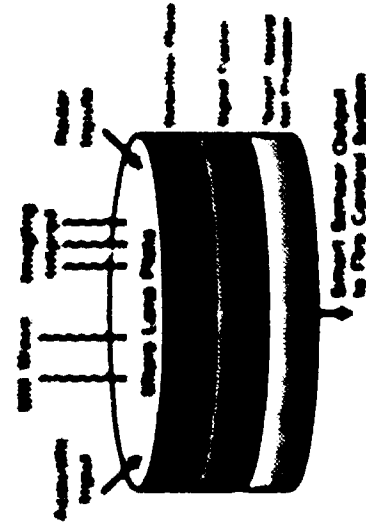


2nd Gen Tank Slight



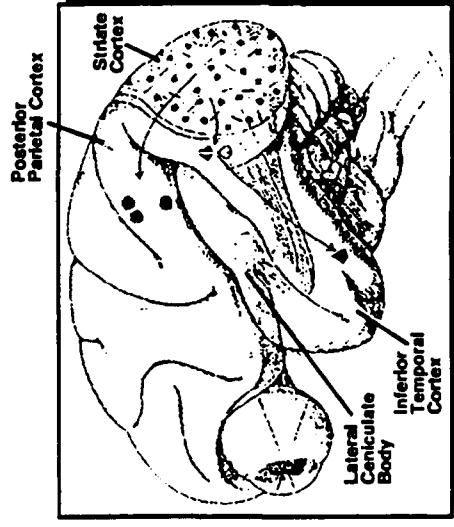
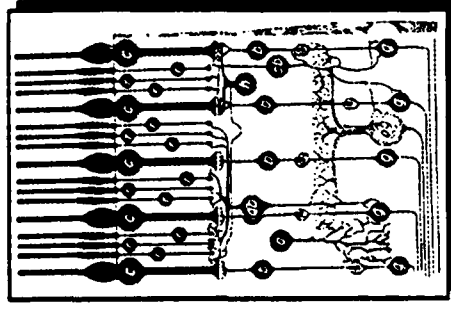
Smart Multi-Sensor Fusion

- FLIR, MMW
- Neural Net Processor
- COM Links



Eye - Brain Electro-Optics

Neuroanatomy → Psychophysiology → Psychophysics



From Mishkin & Appenzeller, 1987

Retinal Layers:

- Integrated Spatially & Temporally
- Function on Differences and Changes (Δ and Motion)
- Transmit Information Back to Cortex

Cortical Areas:

32 Visual Areas Performing Specific Functions

1. Scene Understanding
 - Edges Signal Corners
 - Shadows Used
2. Target Recognition
 - Stage 1, Spatial Filters
 - Resolution
 - S/N
 - Stage 2, Shape Recognition
 - Geometric Primitives
 - Basic Spatial Relations
 - Link to Naming
3. Target Localization/Orientation
 - Near Motor System
 - Separate from Object Recognition

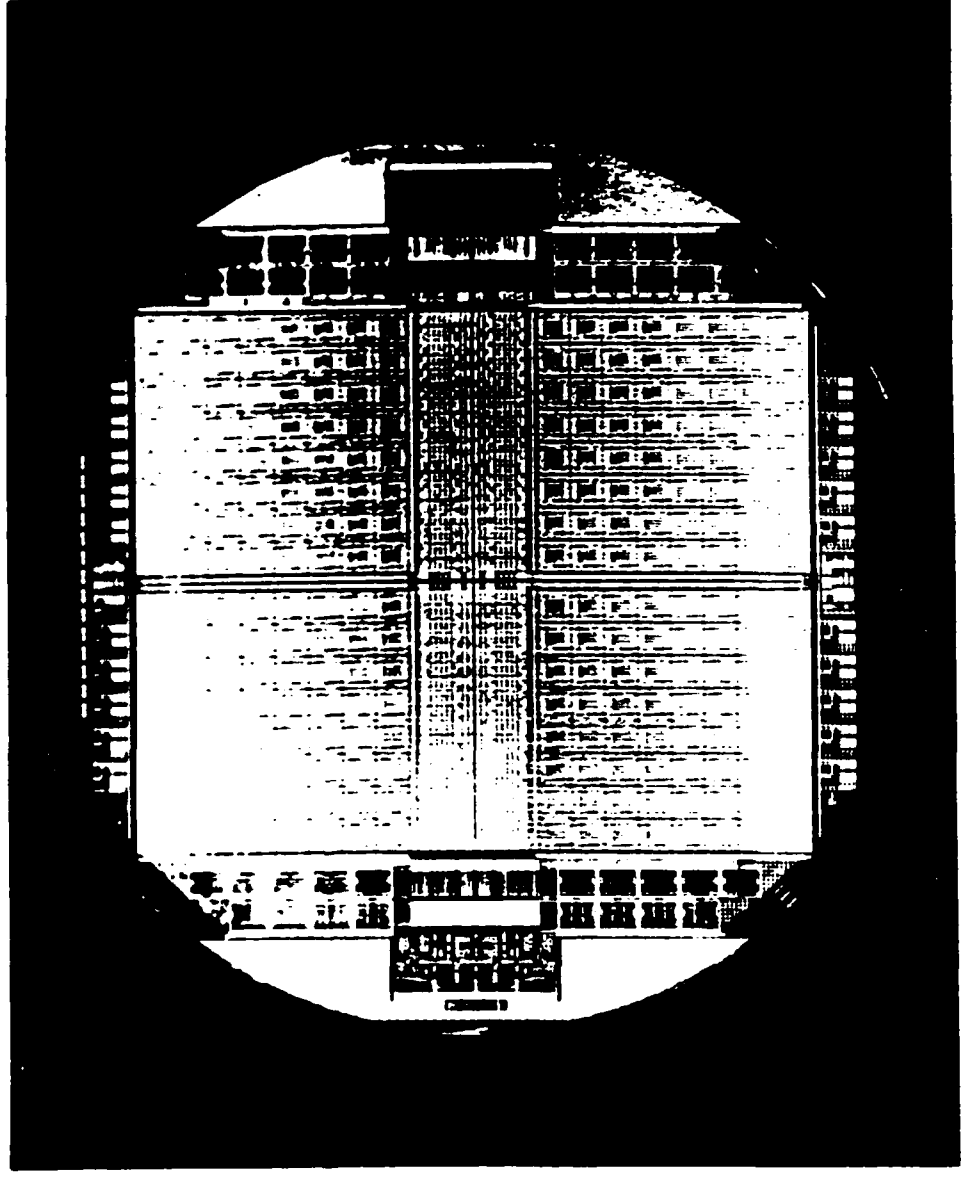
MODULAR MINIATURE PROCESSOR ALADDIN



1 2 3 4 5 6

PROGRAMMABLE SILICON CIRCUIT BOARD INTERCONNECT TECHNOLOGY

H/S-Wafer
With four replaceable segments



ADVANCED PROCESSOR DEVELOPMENT

APPROACH

- **Utilize CAD Techniques to Develop Modular Architecture**
- **Leverage Commercial Components and Software Developments**
- **Demonstrate Rapid Prototyping**
- **Utilize High Density Interconnect Packaging**
- **Demonstrate ATR Algorithm on Processor**

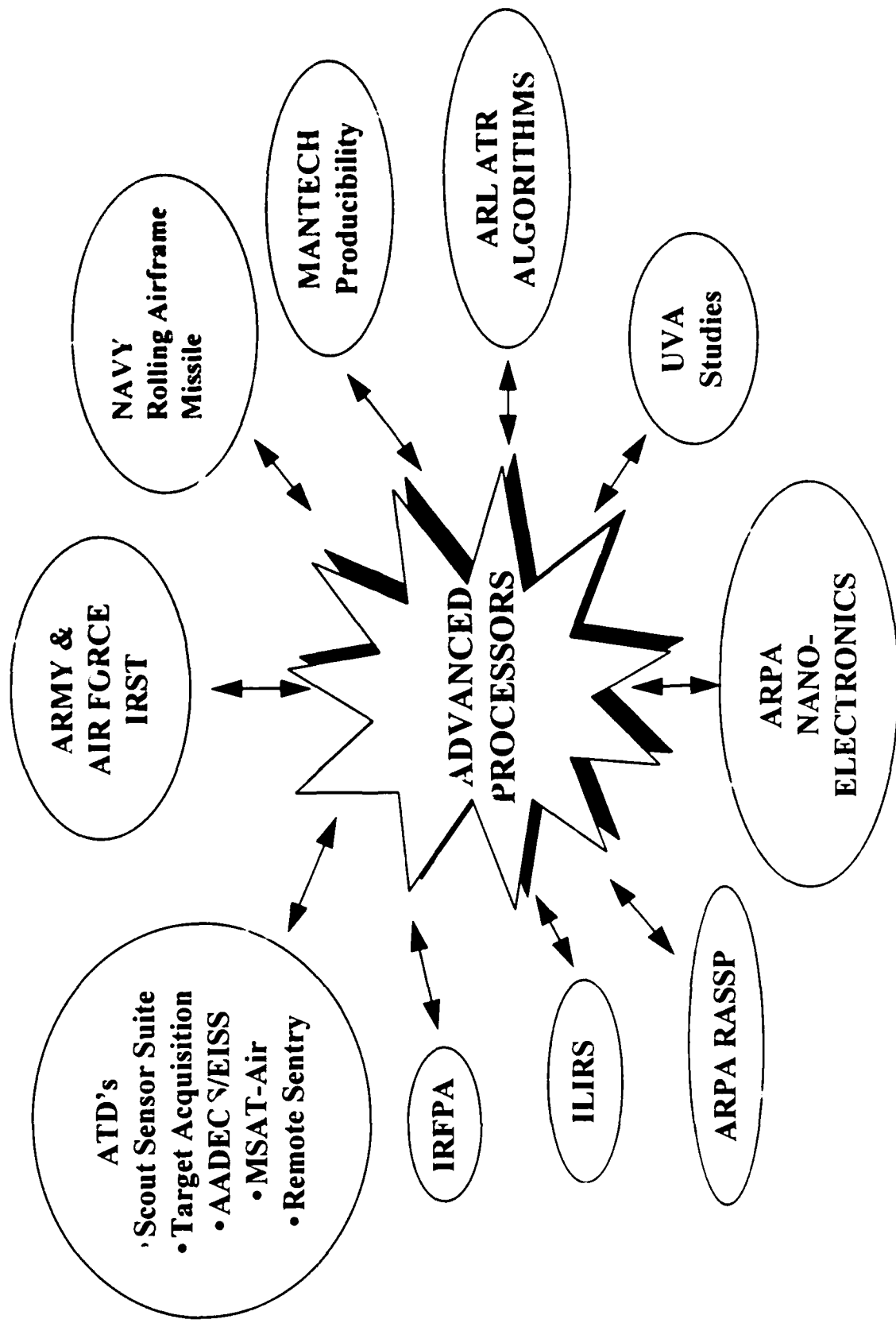
ADVANCED PROCESSOR DEVELOPMENT

EXIT CRITERIA

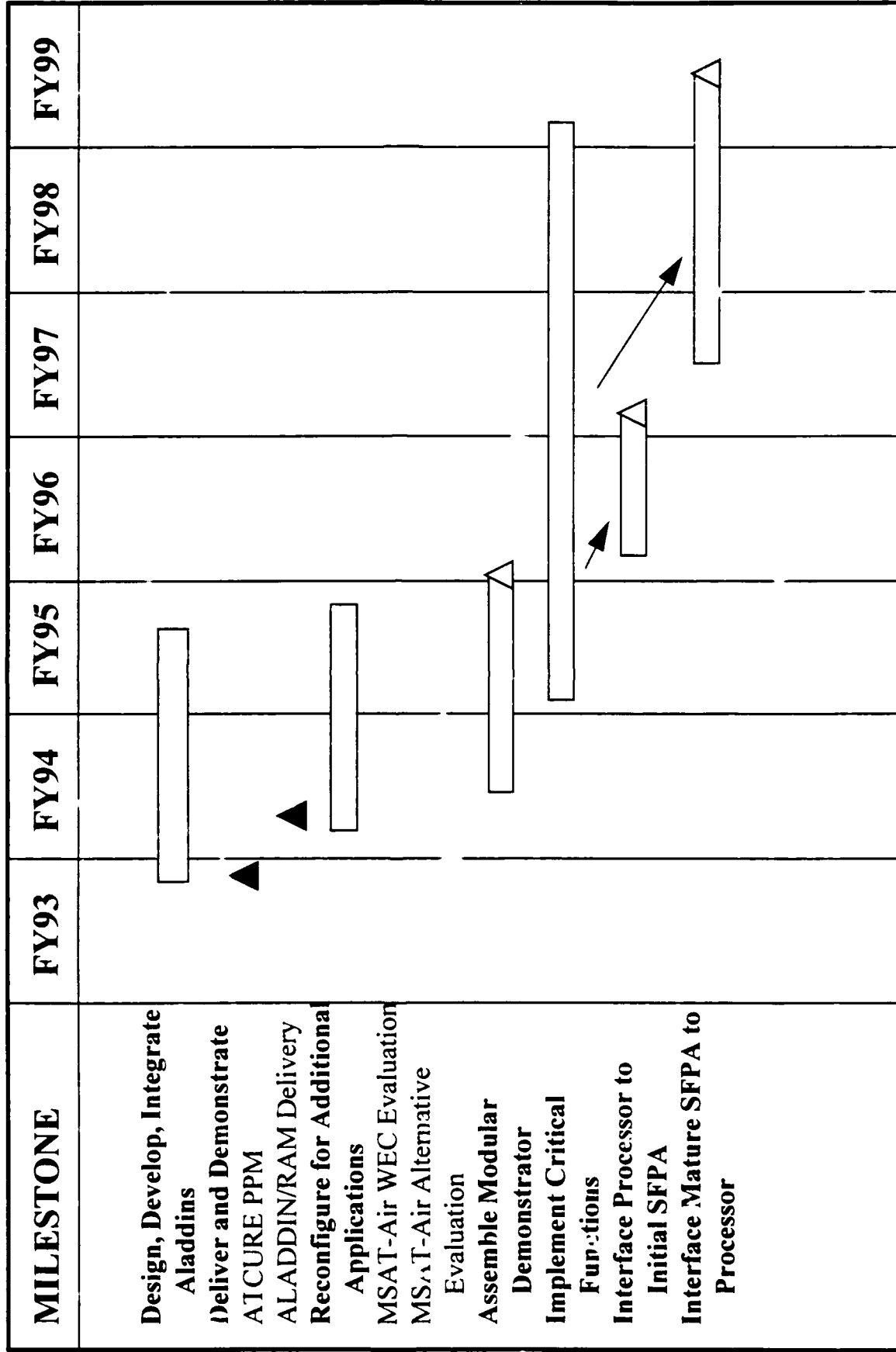
BASELINE	MINIMUM	GOAL
<ul style="list-style-type: none"> Printed Wire Board Technology <ul style="list-style-type: none"> 1 millimeter lines 10K gates/cm² 1.0 Micron BIC MOS Technology Primary Software Languages <ul style="list-style-type: none"> C, Assembly, Microcode System Characteristics <ul style="list-style-type: none"> 25ns SRAM 40 MHz operation 5 Vdc operation Fixed Approach <ul style="list-style-type: none"> Point solution, difficult to evolve with changing processing and sensor I/F requirements Time to Prototype (6-8 mos) <ul style="list-style-type: none"> 1 month for mask design 	<ul style="list-style-type: none"> Multi-Chip Modules <ul style="list-style-type: none"> 25 micron lines 50K Gates/cm² 0.8 Micron BIC MOS Technology Primary Software Languages <ul style="list-style-type: none"> Ada System Characteristics <ul style="list-style-type: none"> 10 ns SRAM 100 MHz operation 5 Vdc operation Modular/Scalable Approach <ul style="list-style-type: none"> Solution can address changing processing requirements Time to Prototype (2-3 mos) <ul style="list-style-type: none"> 1 week for Antifuse implementation 	<ul style="list-style-type: none"> Wafer Scale Integration <ul style="list-style-type: none"> 1-2 micron lines 250K Gates/cm² 0.25 Micron BIC MOS Technology Integrated Real-time SW Tools <ul style="list-style-type: none"> Ada, C/S, Fort, & Case Tools System Characteristics <ul style="list-style-type: none"> 5 ns SRAM 200 MHz operation 1.1 Vdc operation Modular/Scalable Approach <ul style="list-style-type: none"> Solution can address changing requirements & changing sensor I/F requirements Time to Prototype (1 mo.) <ul style="list-style-type: none"> 2 days for Antifuse implementation

ADVANCED PROCESSOR DEVELOPMENT

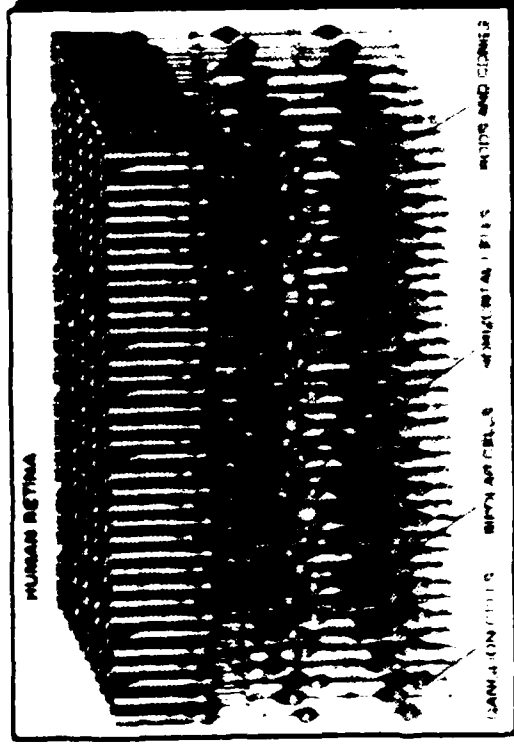
RELATIONSHIPS TO OTHER PROGRAMS/ATDs



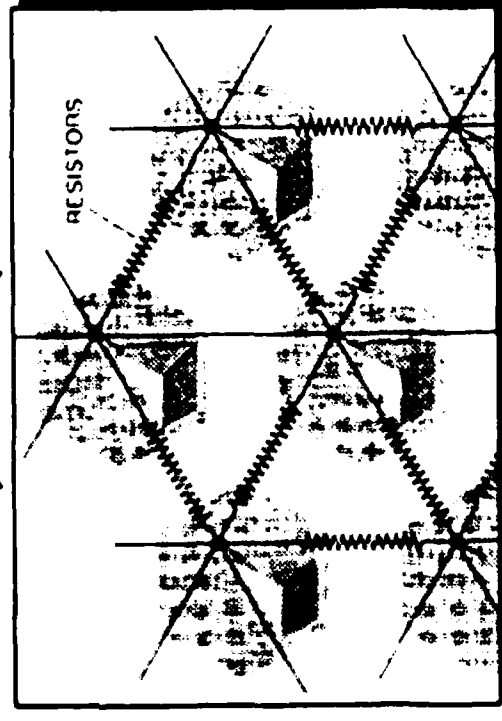
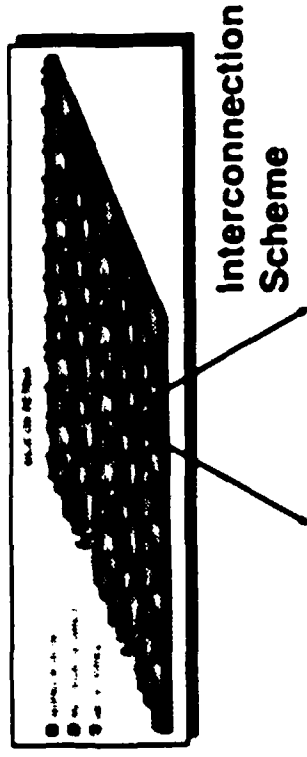
ADVANCED PROCESSOR DEVELOPMENT



Modeling Neural Structures in Silicon



- Carver Mead Silicon Retina
- SD10 Program - Irvine Sensors
 - Silicon Neural Seeker
 - 128 X 128 Array
 - 7 Layers of Neural Processing



How Silicon Retinal Cells are Connected

ADVANCED FOCAL PLANE ARRAYS

APPROACH

- **Explore promising new concepts**
- **Determine viability for Army applications**
- **Establish solid development path towards 3rd generation**
- **Use Government/Industry/Academia cooperative effort**

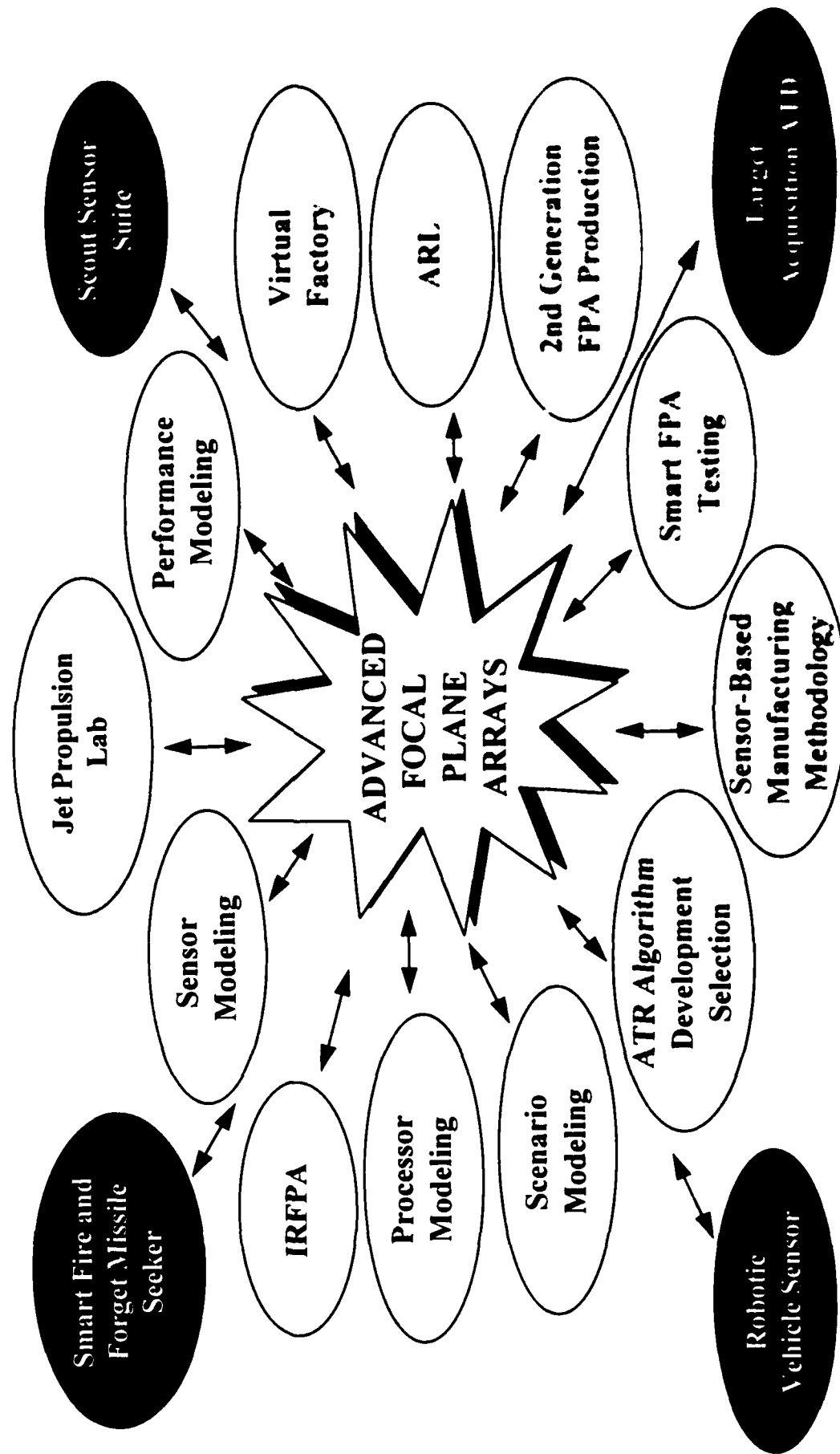
ADVANCED FOCAL PLANE ARRAYS

EXIT CRITERIA

BASELINE	MINIMUM	GOAL
<ul style="list-style-type: none"> • Scanning 480x4 (2nd GEN FPA) • No "SMARTS" In Detector • Sequential Object Processing • In Bump Bonding • Single Waveband Detection 	<ul style="list-style-type: none"> • Staring 480x960 (SMART FPA) • A/D Conversion On Detector • Simultaneous Object Processing • Monolithic • MultiColor 	<ul style="list-style-type: none"> • Staring 1000X2000 (SMART FPA) • Fully Smart Processing on Detector • Simultaneous Object Processing • Monolithic • MultiColor • MultiSensor

ADVANCED FOCAL PLANE ARRAYS

RELATIONSHIPS TO OTHER PROGRAMS/ATDs



ADVANCED FOCAL PLANE ARRAYS

MILESTONE	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Smart FPA Workshop	▲						
Release BAA		△					
First Concepts Investigated		▬					
Develop & Deliver First Smart FPA			▬	▬			
Transition Initial Functions to Technology Demos				▬	▬		
Additional Functions in SFPA Investigation					▬	▬	
Demo in SFPA						△	
Transition to Applications							△

ADVANCED FOCAL PLANE ARRAYS

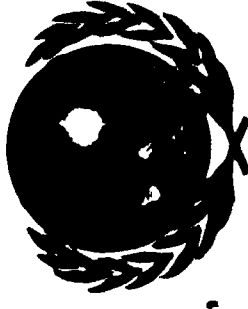
TRANSITION OPPORTUNITIES

- **Provide needed Smart Sensors for:**
 - **Aviation**
 - **Future Attack Air Vehicle**
 - **Lower Echelon Knowledge System**
 - **C2**
 - **'99 Future Technology Demonstration (Heavy)**
 - **Leap Ahead (Light)**
 - **Close Combat**
 - **21 Century Land Warrior**
 - **NCTR for FAAD**
 - **Theater High Altitude Area Defense**
- **Advanced Concepts**
 - **Reconnaissance Projectile**
- **Fire Support**



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE:

DOD Smart Sensor Development

OBJECTIVE:

Develop a Multispectral Smart Sensor (Third Generation)

PROPOSED CONTRACT TYPE: CPFF - BAA

KEY MILESTONES:

Contract Award: 4QFY94

Contract Length: 60 months

ESTIMATED VALUE:

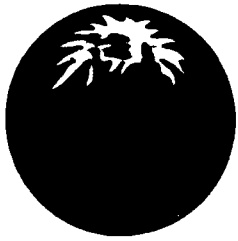
\$6 - 10M

POC TELEPHONE:

Dr. Stuart B. Horn

703-704-2025

NOTES

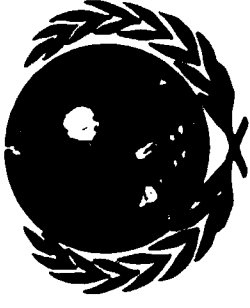


CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



**ADVANCED PROTECTION
TECHNOLOGIES**

MR. RAYMOND A. IRWIN

TEAM LEADER

SURVIVABILITY EQUIPMENT DIVISION

POINT PAPER

SUBJECT: Advanced Planning Briefing for Industry (APBI), 1994, Advanced Protection Technology

OBJECTIVE: Provide industry with upcoming business opportunities within the Night Vision and Electronic Sensors Technology area for advanced planning.

FACTS:

- Under project reliance, the Army is responsible for the R&D of EW protection systems for rotary wing aircraft and ground vehicles.
- The CECOM Night Vision and Electronic Sensors Directorate is the Army acquisition manager for the mission technology funding that supports the development of RF, IR and laser warning and countermeasures technology.
- Countermeasures to IR missiles is the highest priority EW Techbase program. Over ninety percent of all aircraft losses are now due to IR missiles. Advanced flares, missile warning, and on-board countermeasures that can counter pseudo imaging, and focal plane array imaging missile seekers are urgently needed.
- The vision for EW protection equipment is to evolve air and ground vehicle RF/IR/Laser warning and countermeasures to a horizontally integrated multi-spectral, multi-functional system that provides situational awareness, target acquisition and cueing, combat ID assistance, and 360 degrees of vehicle protection.

BRIEFER: Mr. Raymond Irwin
Chief, Technology Demonstration Team
ATTN: AMSEL RD NV SE TD
COMM: 908-544-4589

ACTION OFFICER
THOMAS T. STECK
Resource Management Division
COMM: 703-704-1188

ADVANCED PROTECTION TECHNOLOGIES

OBJECTIVE

- Monopulse/phased array/spread spectrum/bi-static countermeasures
- IRCM vs pseudo-imaging and focal plane array missile seekers
- Laser range/designator/beam rider warning and countermeasures
- Counter fuzes, ATGMs, top attack/smart munitions

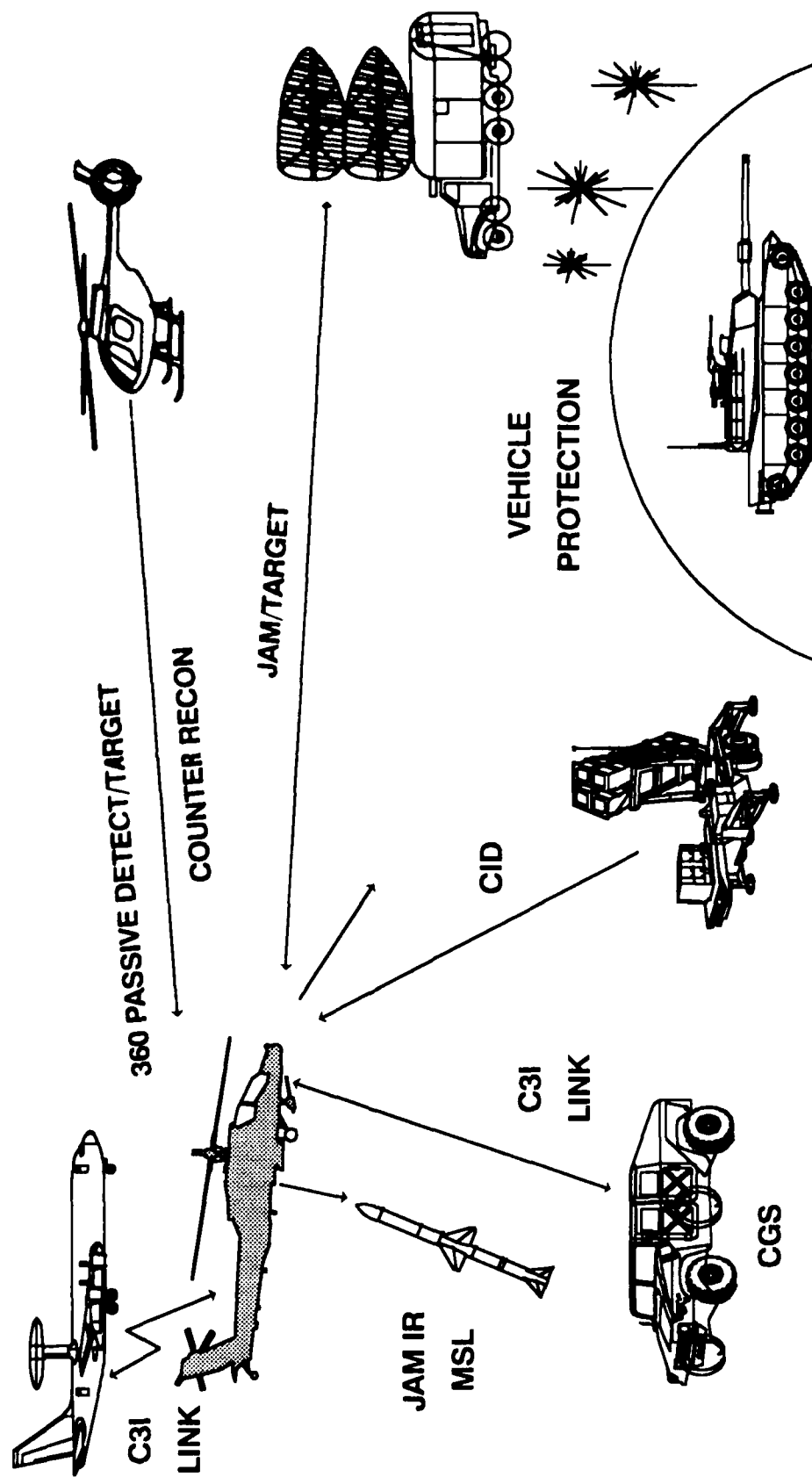
JUSTIFICATION

- Need to protect Army aviation from radar directed and IR homing surface to air missiles (SAMs)
- Need to protect ground vehicles and high value targets from top attack/smart munitions

PROPOSER

- NVESD 6.3a demonstrators
- PM AEC, PM Survivability Systems, PM Firefinder
- Mounted Battle Lab, Depth & Simultaneous Attack Battle Lab, Early Entry Battle Lab

ADVANCED PROTECTION TECHNOLOGIES



ADVANCED PROTECTION TECHNOLOGIES

APPROACH

- **FY94-95 BAA to develop advanced protection technologies - warning and jamming**
- **Potential applications/upgrades and new systems for**
 - **PM-Avionics Electronic Combat**
 - **PM-Survivability systems**
 - **PM-Firefinder**
 - **Special Operations Command (SOCOM)**

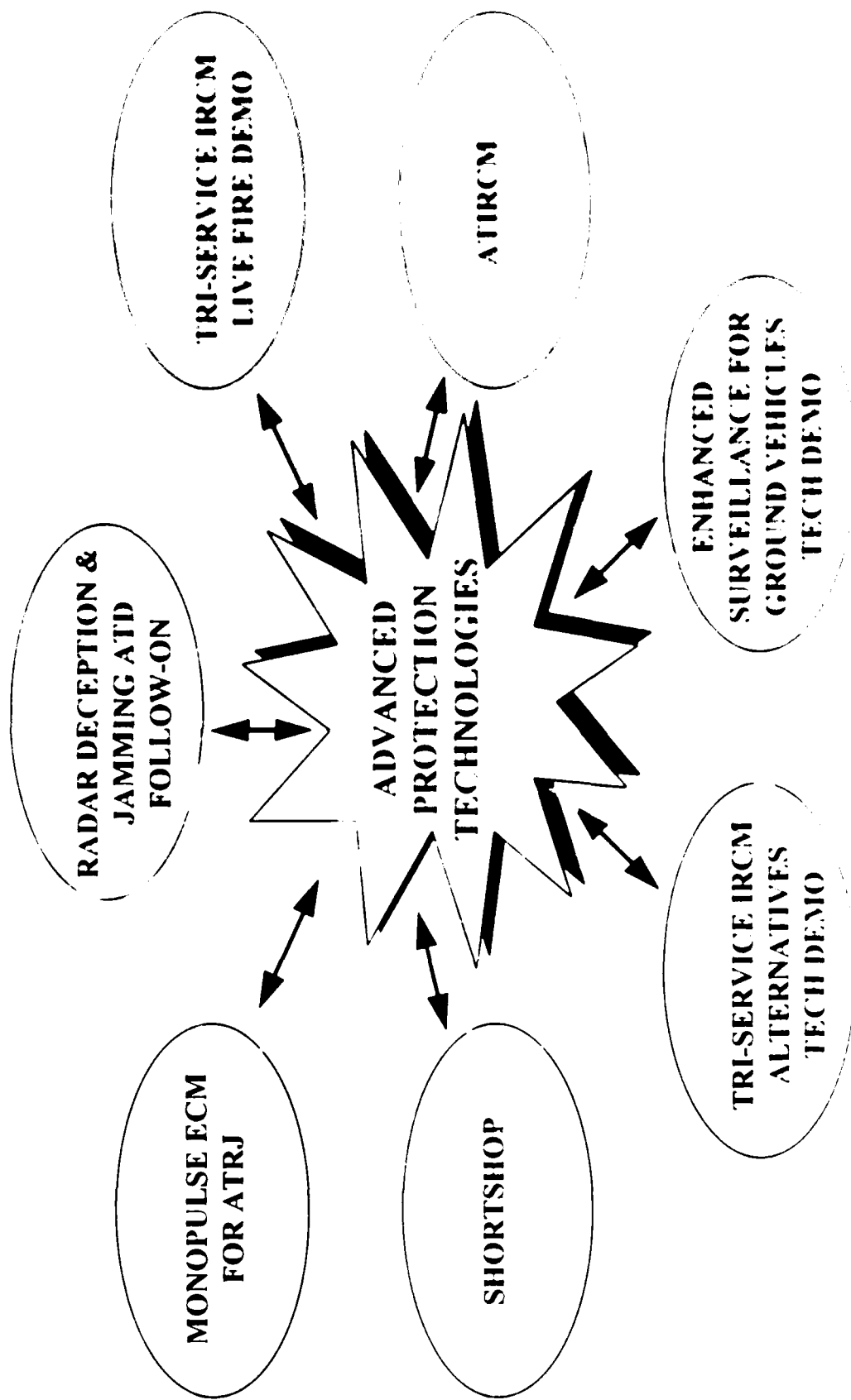
ADVANCED PROTECTION TECHNOLOGIES

EXIT CRITERIA

	BASELINE	MINIMUM	GOAL
<ul style="list-style-type: none"> • Monopulse ECM • Precision DF 	<ul style="list-style-type: none"> • Non-coherent • >12° AOA 	<ul style="list-style-type: none"> • Coherent • <5° AOA 	<ul style="list-style-type: none"> • Bi-static/LPI • <2° AOA
• Imaging seeker C/M	• No capability	• >95% Miss	• >98% Miss
• Simulation of adv foreign seekers	• Spin scan/con scan	• Pseudo-imaging	• Focal Plane Array
• Adv IRCM tracker systems applications	• None	• Mechanical and non-mechanical	• Mechanical and non-mechanical
• Barrage emission	• GLQ-13	• >80% Miss modulated codes	• >98% Miss modulated codes
• decoying of laser aided munitions	• AVR-2	• AOA for >90% counter fire kill	• AOA for >98% counter fire kill
• Embedded laser warning system	• VIQ-6	• >90% ATGMs Miss	• >98% ATGMs Miss
• Diode jammer			

ADVANCED PROTECTION TECHNOLOGIES

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



ADVANCED PROTECTION TECHNOLOGIES

PROGRAM SCHEDULE & FUNDING																
	FY94				FY95				FY96				FY97			
Monopulse ECM																
Precision DF Field Test																
Imaging Seeker Cm																
Simulation of Adv Foreign Seekers																
Adv Tracker Systems Application																
Barrage Emission Decay of Laser Aid Munitions																
Embedded Laser Warning System																
Diode Jammer																

ADVANCED PROTECTION TECHNOLOGIES

TRANSITION PLAN

Advanced Protection Technology

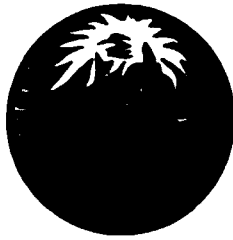
- RF Warning
- RF Jamming
- IRCM
- Laser Warning
- Laser Designated Weapons Countermeasure
- Other Service Lab Programs

ATDs/Technology Demonstrations

- RD & J ATD
- ES&V Technology Demonstration for Hit Avoidance ATD
- IRCM Alternatives Technology Demonstration

PM EMD

- ATRJ
- ATIRCM
- Advanced MSL CM Device (AMCD)
- Shortstop
- AVR - 2+



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Imaging Seeker Countermeasures

OBJECTIVE: Generate laser IRCM techniques capable of defeating the newer missiles

PROPOSED CONTRACT TYPE: BAA

KEY MILESTONES: Contract Award: 3QFY94
Test: 4QFY95
Contract Length: 24 months

ESTIMATED VALUE: \$400-600 K

POC TELEPHONE: Dr. Joe O'Connell
Voice (908) 544-4870
Fax (908) 532-5570/5575



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Advanced Tracker Systems Applications

OBJECTIVE: Investigate the applicability of active tracking/pointing concepts to IRCM systems

PROPOSED CONTRACT TYPE: BAA

KEY MILESTONES:

Contract Award: 3QFY94

Test: 4QFY95

Contract Length: 18 months

ESTIMATED VALUE:

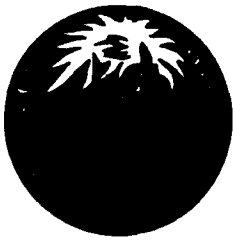
\$100-200 K

POC TELEPHONE:

Dr. Joe O'Connell

Voice (908) 544-4870

Fax (908) 532-5570/5575



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Barrage Emission Decoying of Laser Aided Munitions

OBJECTIVE: Design and develop a laser warning and active laser countermeasure system to protect armored vehicles from laser guided munitions

PROPOSED CONTRACT TYPE: BAA

KEY MILESTONES:

Contract Award: 3QFY94

Test: 3QFY96

Contract Length: 24 months

ESTIMATED VALUE:

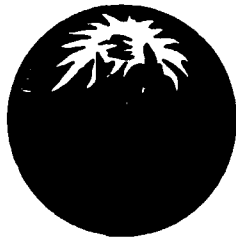
\$400-600 K

POC TELEPHONE:

Dr. Joe O'Connell

Voice (908) 544-4870

Fax (908) 532-5570/5575



CECOM RDEC

**Night Vision and Electronic Sensors
Directorate**



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Diode Jammer

OBJECTIVE: Develop/test laser diode pointing system to counter all known Semi Active Command Line of Sight (SACLOS) ATGM threats

PROPOSED CONTRACT TYPE: BAA

KEY MILESTONES:

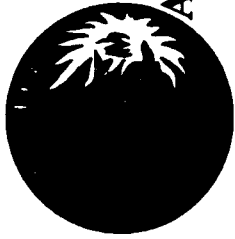
Contract Award: 3QFY94
Test: 1QFY95
Contract Length: 7 months

ESTIMATED VALUE:

\$150-300 K

POC TELEPHONE:

Dr. Joe O'Connell
Voice (908) 544-4870
Fax (908) 532-5570/5575



CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



CONTRACT OPPORTUNITY

TITLE: Monopulse ECM

OBJECTIVE: Develop test bed capable of measuring cross pole ECM and generating coherent jamming techniques and in/out bound aircraft signatures. System will be field portable and have automated data recording and report generation. Field testing of advanced ECM techniques will be conducted in 1996.

PROPOSED CONTRACT TYPE: BAA

KEY MILESTONES:

Contract Award: 3QFY94
Test: 4QFY95 and 3QFY96
Contract Length: 30 months

ESTIMATED VALUE:

\$1.0-1.5 M

POC TELEPHONE:

Mr. Richard Nowicki
Voice (908) 544-3536
Fax (908) 532-5570



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Precision DF Field Test

OBJECTIVE: Demonstrate a 3X directional finding accuracy improvement for radar warning antennas

PROPOSED CONTRACT TYPE: In scope contract modification

KEY MILESTONES:

Contract Award: 3QFY94

Test: 3QFY95

Contract Length: 12 months

ESTIMATED VALUE:

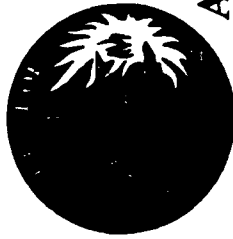
\$300-500 K

POC TELEPHONE:

Mr. Steve Oshel

Voice (908) 544-3936

Fax (908) 532-5570



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Simulation of Advanced Foreign Seekers

OBJECTIVE: Procure focal plane array/processor designed for missile seeker application for subsequent component level investigation of CM effects.

PROPOSED CONTRACT TYPE: BAA

KEY MILESTONES:

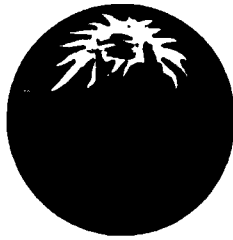
Contract Award: 3QFY94
Test: 3QFY96
Contract Length: 24 months

ESTIMATED VALUE:

\$700-1000 K

POC TELEPHONE:

Dr. Joe O'Connell
Voice (908) 544-4870
Fax (908) 532-5570/5575



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Embedded Laser Warning System (EMLWS)

OBJECTIVE: Design and demonstrate a conformal laser warning system whose optics are fully embedded into the vision blocks of the M1A1 Main Battle Tank. Demonstrate accurate AOA sufficient for counterfire.

PROPOSED CONTRACT TYPE: BAA

KEY MILESTONES: Contract Award: 1QFY95
Test: 1QFY96
Contract Length: 12 months

ESTIMATED VALUE: \$500-700 K

POC TELEPHONE: Dr. Joe O'Connell
Voice (908) 544-4870
Fax (908) 532-5570/5575

All contract actions are dependent upon receipt of FY95 funds.

NOTES

SESSION II

PROPOSED TECHNOLOGY DEMONSTRATIONS

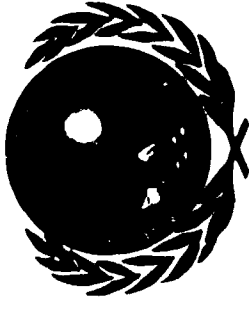


CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



**TARGET ACQUISITION
ATD**

MR. TIMOTHY M. WATTS

PROJECT LEADER

GROUND SYSTEMS INTEGRATION DIVISION

AMSEL-RD-NV

9 FEB 94

POINT PAPER

SUBJECT: CECOM Advanced Planning Briefing for Industry (APBI) on Sensor Advanced Technology Demonstrations

OBJECTIVE: Provide Industry with Upcoming Business Opportunities within the Night Vision and Electronic Sensors Technology Area for Advanced Planning.

- FACTS:
- Target Acquisition Advanced Technology Demonstrator is a major participant in the Department of the Army's Science & Technology Thrust Area Five, Advanced Land Combat.
 - Target Acquisition Advanced Technology Demonstrator will participate in the Advanced Land Combat's Future Main Battle Tank (FMBT) Top Level Demonstration.
 - Target Acquisition Advanced Technology Demonstrator consolidate the key technologies of Second Generation Thermal Imaging, Millimeter Wave Radar, and Aided Target Recognition algorithms.

BRIEFER: Mr. Timothy M. Watts
Ground Systems Integration Division
ATTN: AMSEL-RD-NV-GSID
COMM: 703-704-1356

ACTION OFFICER
Thomas T. Steck
Resource Management Division
COMM: 703-704-1188

TARGET ACQUISITION ATD

OBJECTIVE

Provide combat vehicles with improved long range target acquisition through the synergistic utilization of second generation thermal imaging, millimeter wave radar, and advanced aided target acquisition algorithms

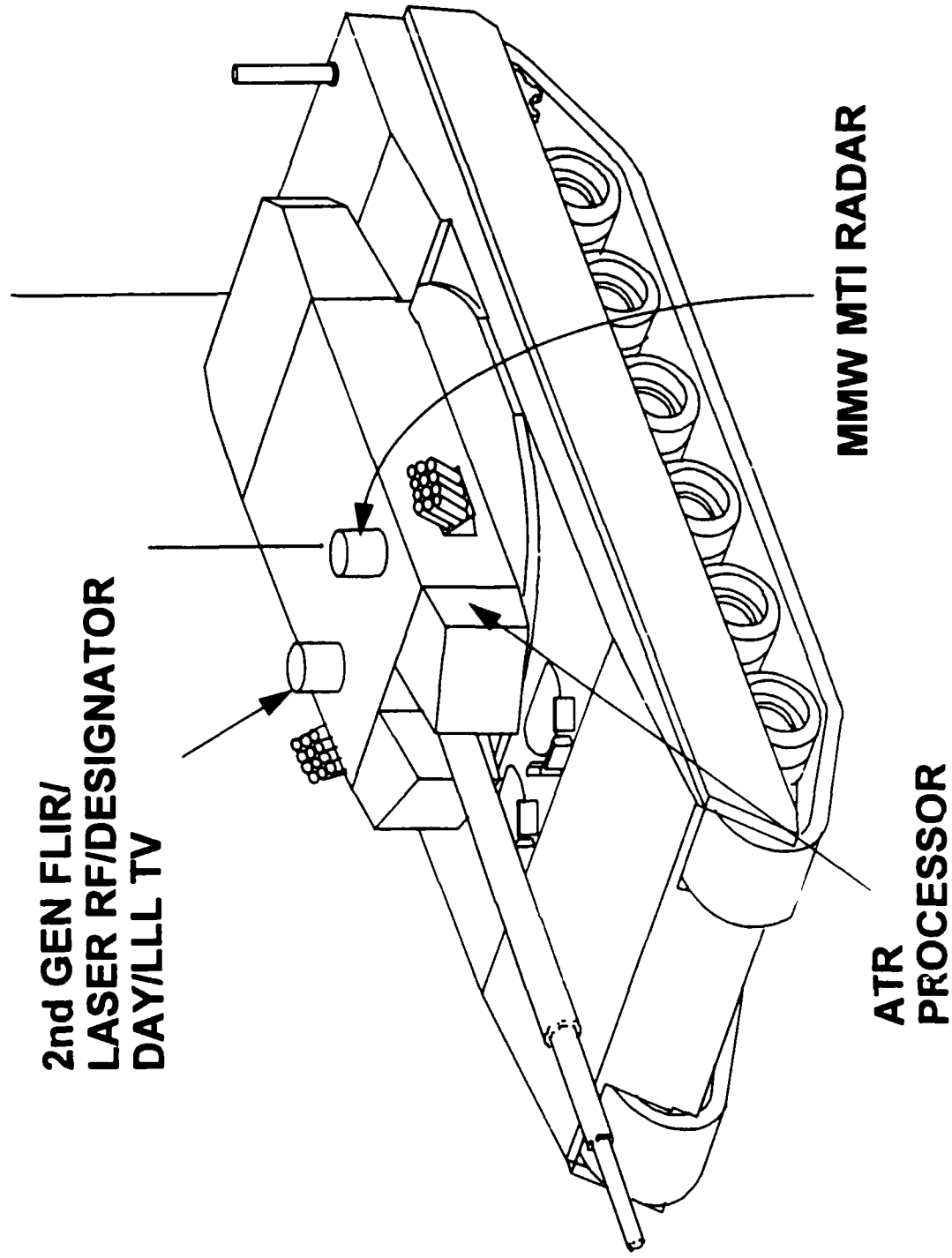
JUSTIFICATION

- Key ATD support of Thrust 5 AVT
- Provides automated wide area search and aided target acquisition at extended ranges
- Provides prioritization with automated target cueing/tracking/handoff
- Reduces crew workload & timelines in support of lethal, deployable combat vehicles with fewer crewmembers

PROONENT

- Mounted Battlespace

TARGET ACQUISITION ATD



TARGET ACQUISITION ATD

APPROACH

- **Integrate modular, ground based algorithms, a high density processor and a second generation FLIR Sensor Suite into a surrogate chassis for an operational demonstration**
- **Provide MTI millimeter wave radar for target acquisition, tracking and cueing enhancement in degraded atmospheric conditions**
- **Integrate with combined arms command and control network, through crewman's associate ATD, for improved situational awareness**
- **Incorporate IPPD approach to address producibility and affordability risk areas**
- **Design for growth into Sensor Fusion**

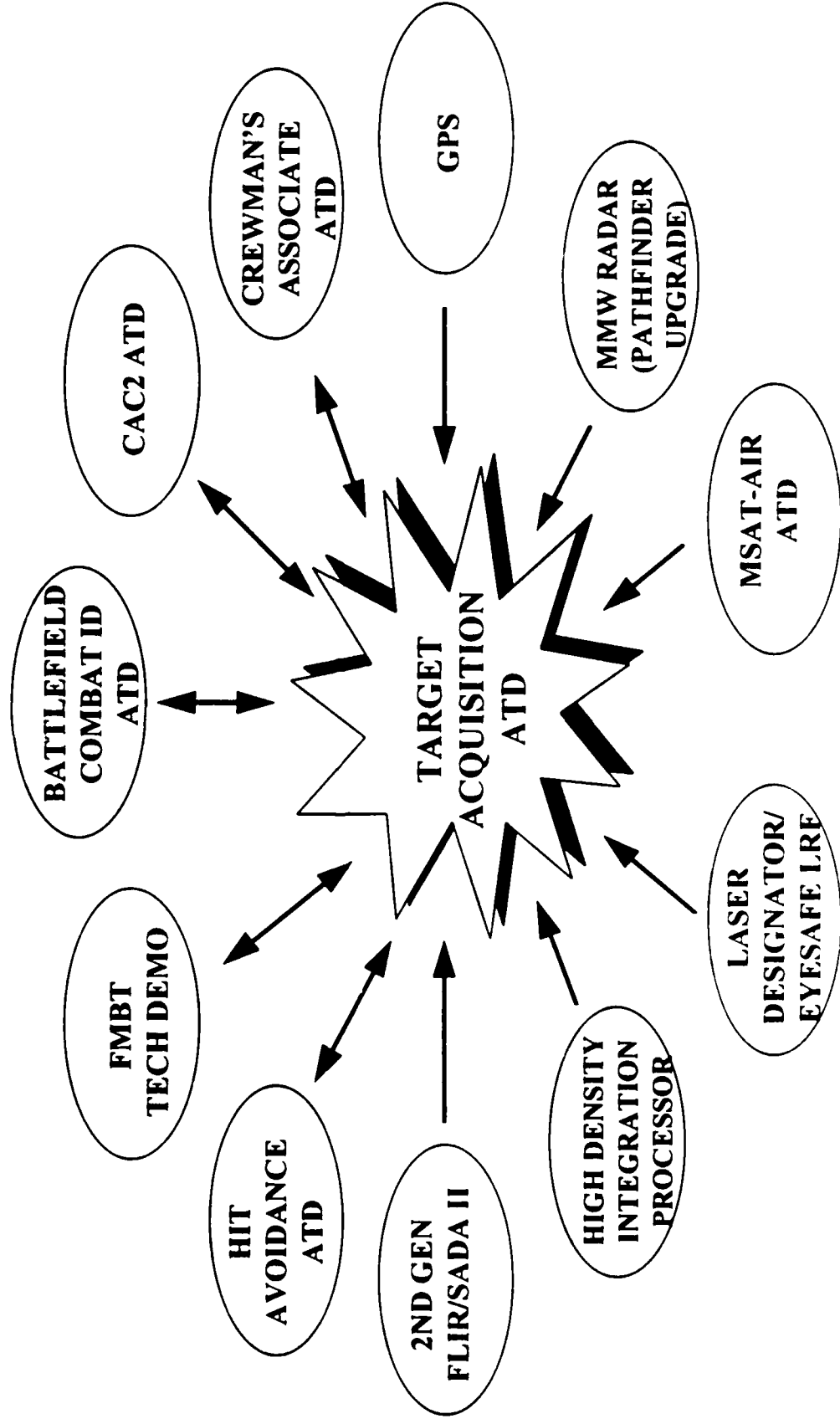
TARGET ACQUISITION ATD

PROPOSED EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD	
		MINIMUM	GOAL
FLIR w/o ATR Time to Detect Range	<u>1st - Gen</u> 1 1	<u>2nd - Gen</u> 0.6 1.5	<u>2nd - Gen</u> 0.4 2.0
			GOOD WEATHER ALL TARGETS
FLIR w / ATR Time to Detect False Alarm (Pd = 0.7) Range	<u>N / A</u>	0.4 <u>1.0</u> 1.5	0.2 <u>1.0</u> 2.0
			GOOD WEATHER ALL TARGETS
FLIR, w / ATR, MTI Time to Detect False Alarm (Pd = 0.7) Range	<u>N / A</u>	<u>TBD</u> <u>TBD</u> 1.5	<u>TBD</u> <u>TBD</u> 2.0
			ALL WEATHER MOVING TARGETS
FLIR, w / ATR, STI (Growth to Fusion) Time to Detect False Alarm (Pd = 0.7) Range	<u>N / A</u>	0.2 <u>0.9</u> 1.5	0.1 <u>0.9</u> 2.0
			ALL WEATHER ALL TARGETS

TARGET ACQUISITION ATD

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



TARGET ACQUISITION ATD

PROGRAM SCHEDULE

	FY94	FY95	FY96	FY97	FY98	FY99
Modeling & Simulation						
Pre- Warfighting Exp.						
Award						
Sensors Fabrication/ Packaging/Integration						
Demo/Baseline Sensor Suite Performance						
Algorithm Modification/ Processor Integration						
Integrate/Demo Sensor Suite & Processor on Surrogate Vehicle						
MTI Millimeter Wave Radar						
Integration into FMBT Vehicle						
Future Main Battle Tank ATD						

TARGET ACQUISITION ATD

TRANSITION PLAN

- **Target Acquisition advanced technology demonstration hardware will transition to the Future Main Battle Tank Top Level Demonstration**
- **Technology may transition into engineering development based upon successful demonstration**



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Target Acquisition Advanced Technology Demonstrator

OBJECTIVE: Demonstrate automated wide area search and aided target acquisition and prioritization with automated target cueing/tracking/handoff at extended ranges to allow reduced crew workload/timelines in support of lethal, deployable combat vehicles with fewer crew members.


PROPOSED CONTRACT TYPE: CPAF

KEY MILESTONES: Contract Award: 1QFY95
Contract Length: 30-36 months

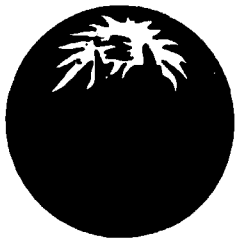
ESTIMATED VALUE: \$15M-\$20M

POC TELEPHONE: Mr. Timothy M. Watts
703-704-1356

All contract actions are dependent upon receipt of FY95 funds.



NOTES



CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



**AERIAL SCOUT SENSORS
INTEGRATION TECHNOLOGY
DEMONSTRATION**

MR. JAMES MATHENY

PROJECT LEADER, AIR SYSTEMS INTEGRATION DIVISION

10 February 1994

POINT PAPER

SUBJECT: Advance Planning Briefing for Industry (APBI)

OBJECTIVE: Provide Industry with Information on Upcoming Business Opportunity withing the Night Vision Airborne Scout Sensor Integration (ASSI) Technology Development (TD)program.

FACTS:

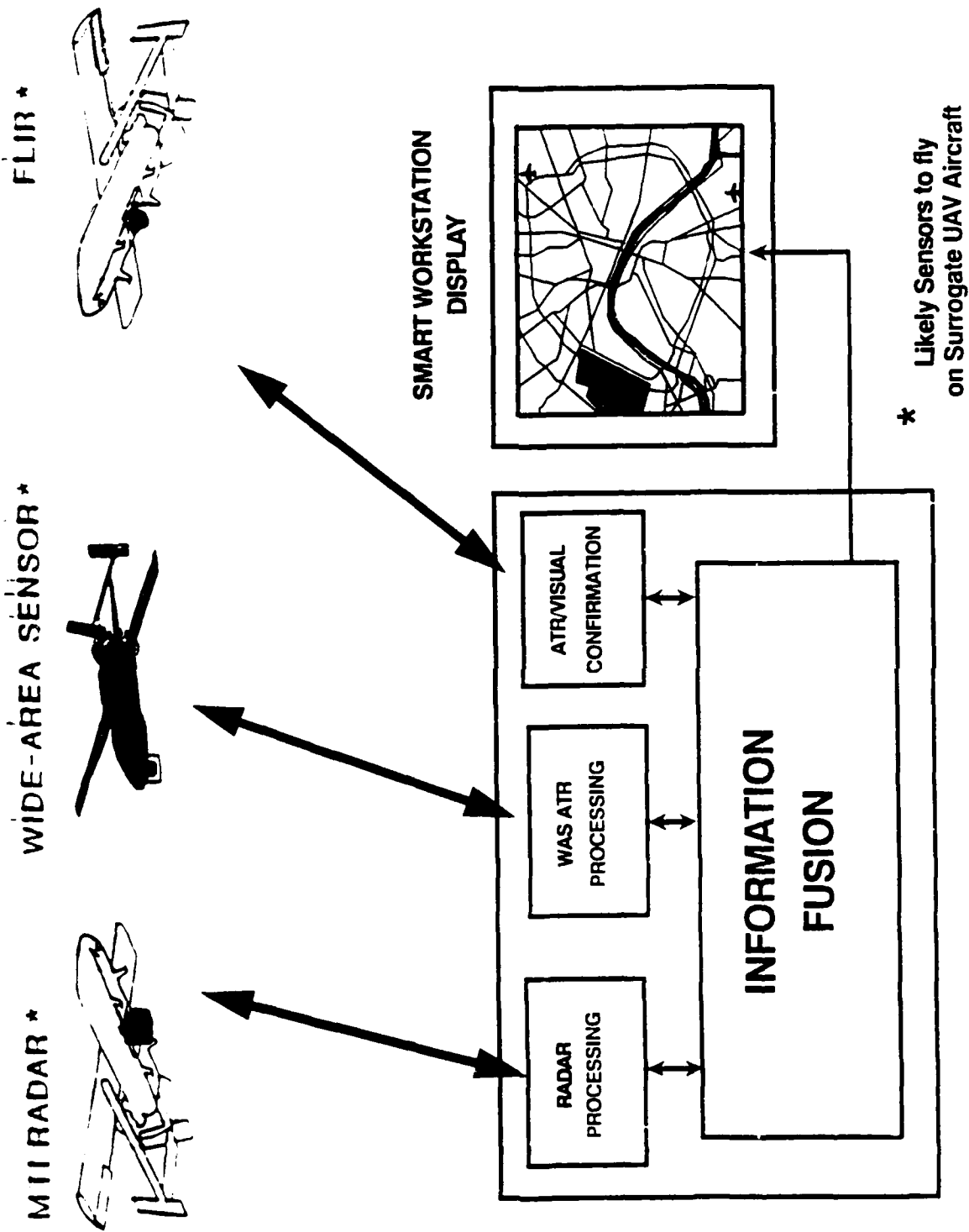
--The Rapid Force Projection Initiative (RFPI) under the Advanced Land Combat Top Level Demo has need for Aerial Surveillance to augment the land based Scout Sensor Suite.

--Electro-Optic/Radarcomputer/Aided Target Recognition/Data Link/Data Compression technology exists to fill this need.

--The ASSI TD will provide the vehicle and focus the efforts to demonstrate the integration of this technology and display it with a smart workstation to provide "see over the hill" reconnaissance capability, target designation and Battle Damage Assessment (BDA) to the battle field commander.

BRIEFER: Mr. James R. Matheny
Project Leader, ASSI TD
ATTN: AMSEL-RD-NV-ASID
Comm: 703-704-1193

ACTION OFFICER
Thomas T. Steck
Resource Management Division
COMM: 703-704-1188



AERIAL SCOUT SENSORS INTEGRATION TD

OBJECTIVE

Demonstrate utility of using airborne sensors to augment ability of ground-based scouts by application of advanced over-the-hill battlefield reconnaissance, surveillance, and battle damage assessment techniques.

JUSTIFICATION

- Provides the battlefield commander with airborne sensor assets under direct, immediate control
- Optimum sensor mix gives the ground-based scouts here-to-fore unavailable information in real or near real time
 - Very large area moving target detection
 - Wide area mapping and uncued area search of both “movers” and “sitters”
 - Localized target confirmation
- Aided Target Recognition (ATR) plus sensor fusion/cross correlation technology with smart workstation techniques minimizes operator workload and timelines

PROONENT

- Dismounted Battle Lab

AERIAL SCOUT SENSORS INTEGRATION TD

APPROACH

- **Determine system/hardware tradeoffs for optimum configuration of sensors, ATR, and datalink/data compression to best accomplish targeting for non-line-of-sight weapons**
- **Application of smart data handling, fusion, analysis, and distribution**
- **Use of advanced aided/automated target recognition (ATR) algorithms**
- **Make maximum use of information from existing sensors**
- **The ASSI TD is not an effort to develop new sensors**

AERIAL SCOUT SENSORS INTEGRATION TD

TECHNICAL CHALLENGES

- System/hardware tradeoff analyses
 - On aircraft processing
 - Data link bandwidth
 - Data compression
- Smart workstation integration/data fusion
- Advanced Aided/Automatic Target Recognition (ATR) algorithms
- Target location accuracy
 - Gimbal AZ/EL accuracy and alignment with airframe
 - Aircraft attitude
 - Processor latency
 - Dynamic targets

DRAFT EXIT CRITERIA FOR ASSI TD

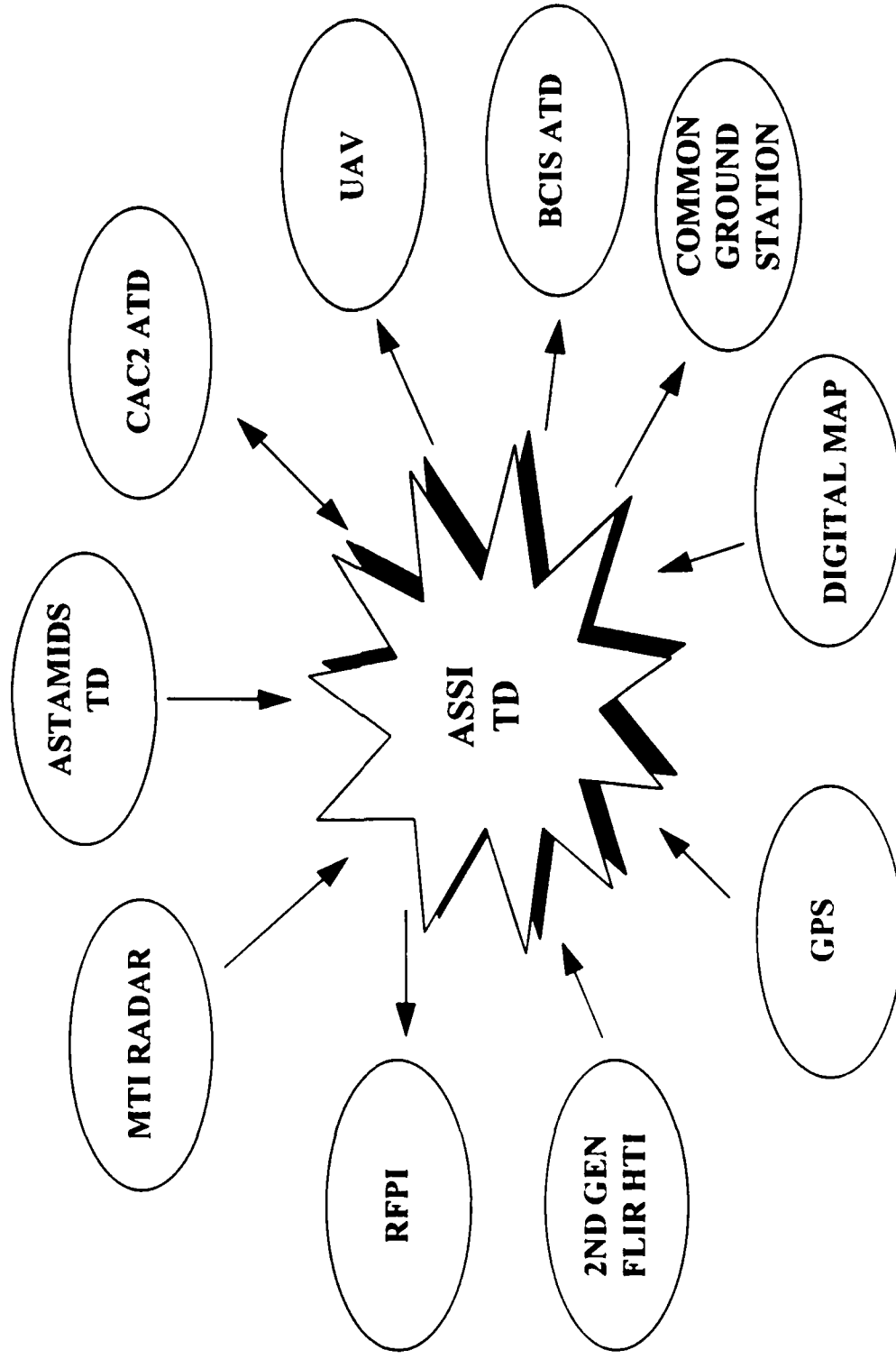
OPERATIONAL CAPABILITY	CURRENT BASELINE	TD MINIMUM	TD GOAL
SURVEILLANCE AVAILABILITY	VARIOUS SOURCES	24-HOUR	24 HR/ADV. WEATHER
BATTLE DAMAGE ASSESSMENT	NON REAL-TIME	NEAR REAL-TIME	NEAR REAL-TIME
TGT. LOCATION ACCURACY *	VARIABLE	100m CEP	30m CEP
COVERAGE RATE	VARIABLE	160 sq.mi./hr	240 sq.mi./hr
DATA TIMELINESS *	1-5 HRS	< 1 HOUR	< 1 HOUR
RESOLUTION	VARIABLE	0.75mR	0.25mR

* NOTE: TGT Loc assumes flat earth & 1Km Altitude
Data Timeliness from tasking to receipt of data

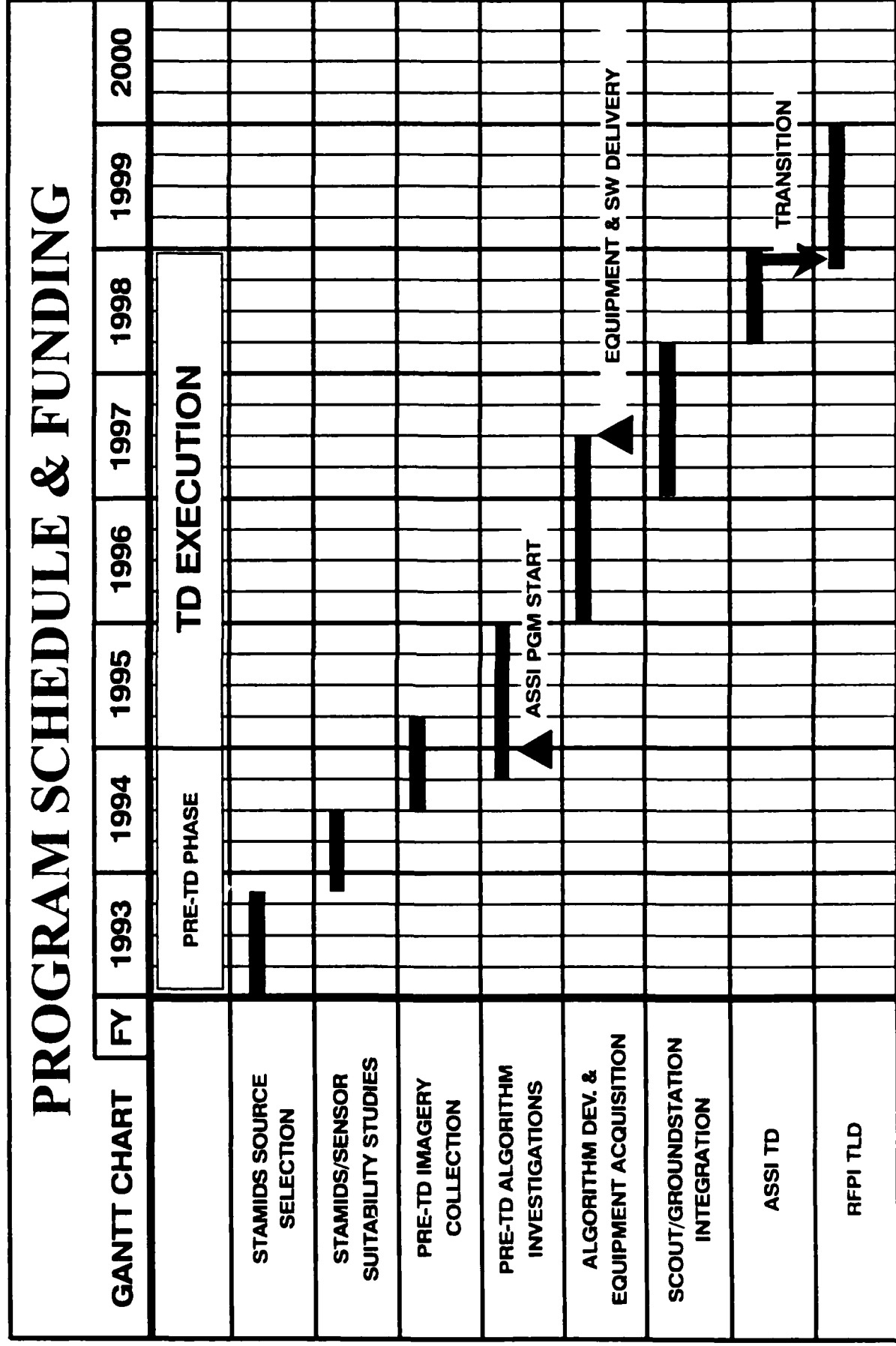
AERIAL SCOUT SENSORS

INTEGRATION TD

RELATIONSHIPS TO OTHER PROGRAMS/ATD's



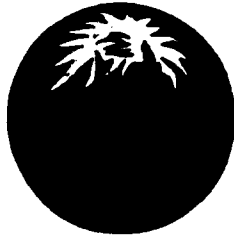
Aerial Scout Sensors Integration TD



AERIAL SCOUT SENSORS INTEGRATION TD

TRANSITION PLAN

- Complete ASSI developments by 4QFY98
- Transition ASSI to RFPI Top Level Demo in 1QFY99
- Program Executive Office - Intelligence and Electronic Warfare
- Potential transition to Unmanned Aerial Vehicles - Joint Program Office



CECOM RDEC

Night Vision and Electronic Sensors

Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Aerial Scout Sensors Integration Technology Demonstrations

OBJECTIVE: Assist in the integration of several existing sensors on two or more aircraft and fuse/correlate the imagery and data with advanced smart workstation exploitation techniques to demonstrate the advantages of adding an airborne scout capability to the ground-based scouts for the Light Contingency Forces

PROPOSED CONTRACT TYPE: CPAF

KEY MILESTONES: Contract Award: 2QFY95
Contract Length: 60 months

ESTIMATED VALUE: \$8 - \$12 M

POC TELEPHONE: Mr. Jim Matheny
703-704-1193

All contract actions are dependent upon receipt of FY95 funds.

NOTES



CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



**INTEGRATED SIGHT MODULES
TECHNOLOGY DEMONSTRATION**

**MARTIN WEAVER
TEAM LEADER, INFANTRY SYSTEMS**

27 January 1994

POINT PAPER

SUBJECT: Integrated Sight Modules Technology Demonstration, CECOM Advanced Planning for Industry (APBI) on Sensor Advanced Technology Demonstrations

OBJECTIVE: Provides Industry with upcoming Business Opportunities within the Night Vision and Electronic Sensors Technology Area for Advanced Planning.

FACTS: The purpose of the Integrated Sight Modules TD is to develop and demonstrate technology at the component level and integrate the functions of a laser rangefinder, thermal imager, electronic compass, IR pointer, and wind sensors into a single system capable of finding targets at extended ranges, supporting advanced weapons, and automatically transmitting the target information to higher echelons.

BRIEFER: Mr. Martin Weaver
Chief, Infantry Systems Team
ATTN: AMSEL-RD-NV-GSID
COMM: 703-704-1297

ACTION OFFICER:
Thomas T. Steck
Resource Management Division
COMM: 703-704-1188

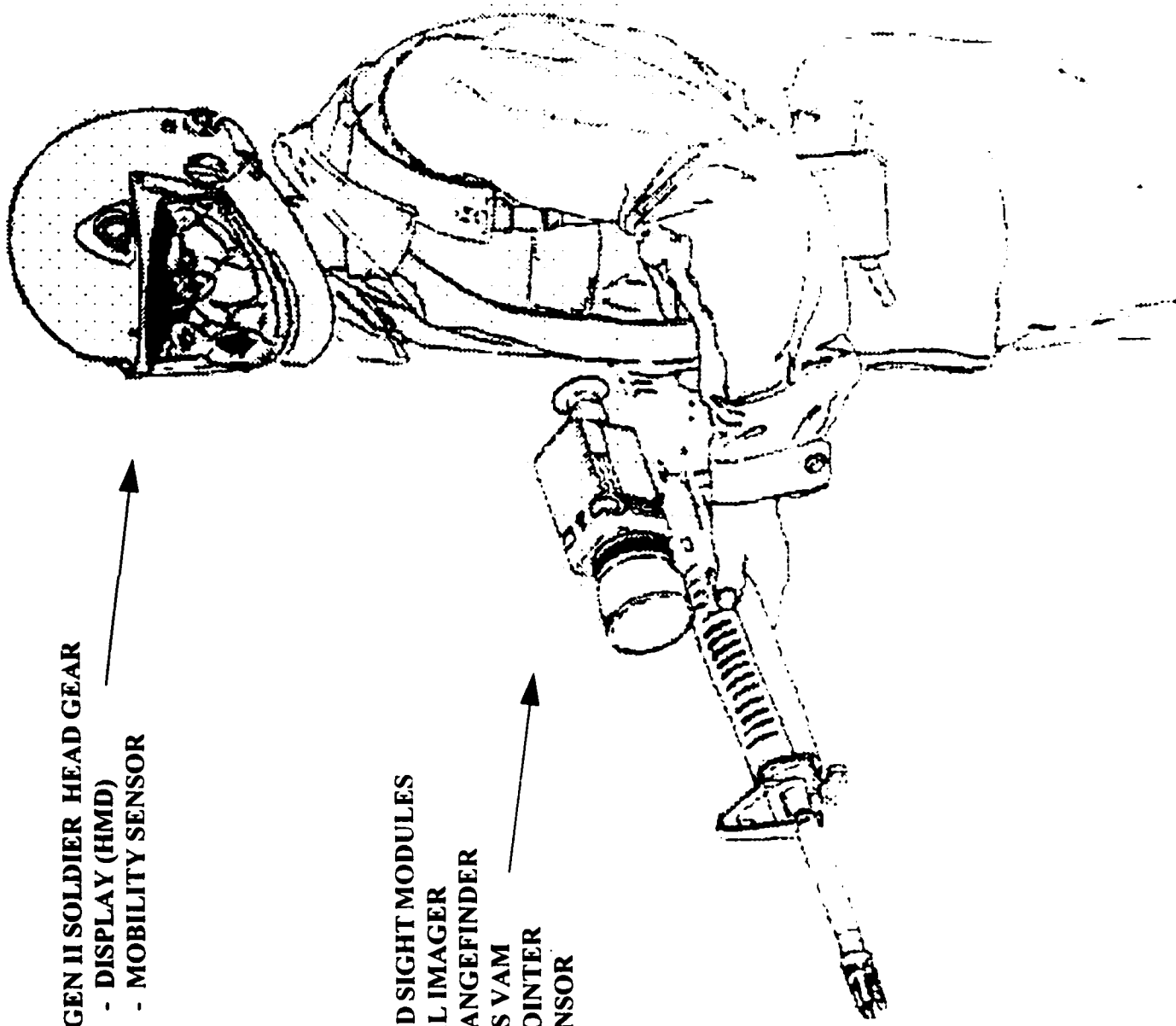
GEN II SOLDIER HEAD GEAR

- DISPLAY (HMD)
- MOBILITY SENSOR



INTEGRATED SIGHT MODULES

- THERMAL IMAGER
- LASER RANGEFINDER
- COMPASS VAM
- LASER POINTER
- WIND SENSOR



INTEGRATED SIGHT MODULES TD

OBJECTIVE

Demonstrate the integration of manportable laser rangefinder, thermal imager, electronic compass, IR pointer, and wind sensors into a single modular system capable of finding targets at extended ranges, supporting advanced weapons, and automatically transmitting the target information to higher echelons.

JUSTIFICATION

- Increases Warfighting Capability in Lethality and Survivability for the 21st Century Land Warrior Top Level Demonstration

PROONENT

- Dismounted Battle Lab

INTEGRATED SIGHT MODULES TD

APPROACH

- **Reduce weight and power requirements of the Thermal Imaging Module**
- **Reduce weight and increase accuracy of the Laser Range Finder Module**
- **Reduce size and increase reliability of the Compass/Vertical Angle Measurement module**
- **Increase range of the IR Pointer Module**
- **Demonstrate the capabilities of range and cross-wind sensors**
- **Eliminate or reduce interference between modules**
- **Provide data output in a standard format (RS-170 and RS-232)**

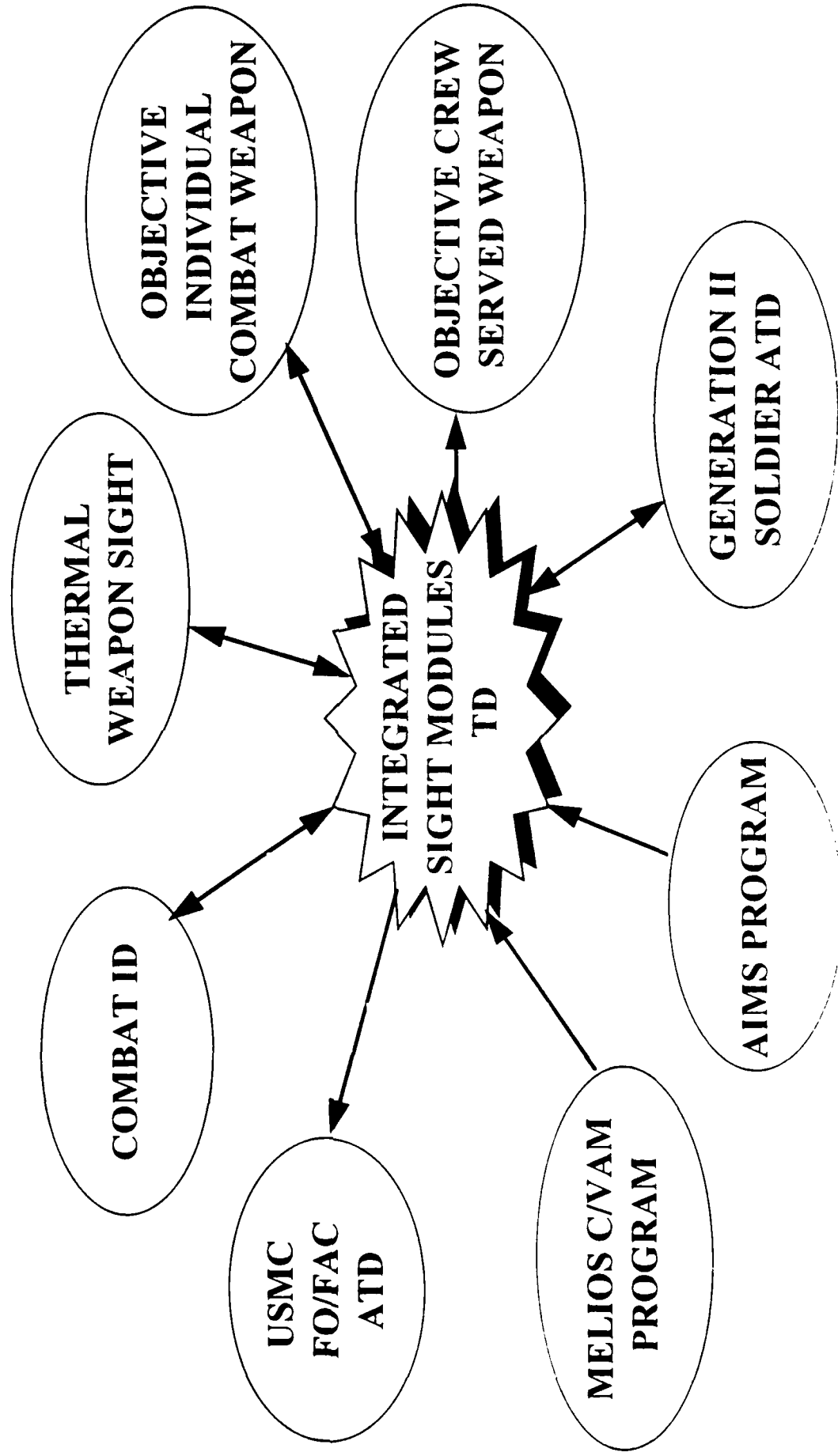
INTEGRATED SIGHT MODULES TD

EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	MINIMUM	GOAL
THERMAL SIGHT	TWS		
• WEIGHT	4.35 lbs	4.0 lbs	3.5 lbs
• POWER	10 Watts	8 Watts	5 Watts
LASER RANGEFINDER	MELIOS		
• ACCURACY	± 5 m	± 2 m	± 1 m
• WEIGHT	3.5 lbs	1 lb	< 1lb
ELECTRONIC COMPASS	C/VAM		
• RESOLUTION	± 15 mils	± 15 mil	± 10 mils
• WEIGHT	.5 lbs	.4 lbs	.3 lbs
LASER POINTER	AN/PAQ-4B		
• RANGE	600 m	1000 m	> 1000 m

INTEGRATED SIGHT MODULES TD

RELATIONSHIPS TO OTHER PROGRAMS /ATDs /TDs



INTEGRATED SIGHT MODULES TD

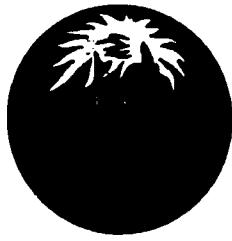
SCHEDULE

	FY 94	FY 95	FY 96	FY 97	FY 98
<u>BAA</u>					
Contract Award	△				
Design Reviews	△				
Components delivered	△	△	△		
<u>RFP</u>					
Contract Award					
Design Reviews					
Integration					
Test/Analyze/Fix					
Field test					
21 CLW TLD					

INTEGRATED SIGHT MODULES TD

TRANSITION PLAN

- Technology as demonstrated at the module level will be transitioned to the US Army Armaments RD&EC for the Objective Individual Combat Weapon (OICW) and the Objective Crew Served Weapon (OCSW) Programs
- After Demonstration of the Integrated System in 21st Century Land Warrior (CLW) Top Level Demonstration (TLD) it will be transitioned to 21st CLW Engineering and Manufacturing Development (E&MD) Program
- The technology will support the development of the USMC Forward Observer/Forward Air Controller (FO/FAC) Program



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Integrated Sight Modules TD

OBJECTIVE: Demonstrate Integrated Laser, Compass, and Thermal Technologies for Advanced Lightweight Weapon Sights

PROPOSED CONTRACT TYPE: CPAF

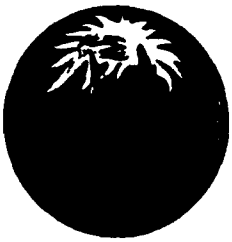
KEY MILESTONES: Contract Award: 2QFY96
Contract Length: 30 months

ESTIMATED VALUE: \$2 - \$5M

POC TELEPHONE: Mr. Lawrence T. Marshall
703-704-1119

All contract actions are dependent upon receipt of FY96 funds.

NOTES



CECOM RDEC

Night Vision and Electronic Sensors

Directorate

APBI "CECOM Sensor Advanced Technology Demonstrations"



**ADVANCED
HELMET MOUNTED DISPLAY
FOR ARMY ROTORCRAFT**

**MR. PHILIP PERCONTI
PROJECT LEADER
AIR SYSTEMS INTEGRATION DIVISION**

27 January 1994

POINT PAPER

SUBJECT: Advanced Helmet Mounted Display for Army Rotorcraft, CECOM Advanced Planning for Industry (APBI)

OBJECTIVE: Provides industry with upcoming Business Opportunities within the Night Vision & Electronics Sensors Technology Area for Advanced Planning.

FACTS: The purpose of the Advanced Helmet Mounted Display for Army Rotorcraft TD is to demonstrate, in flight, a revolutionary helmet mounted display for night/adverse weather rotorcraft pilotage. This TD will concentrate on form factor, fit, and function, as well as other technical issues related to the implementation of miniature display technology to an extremely light weight, very wide field of view, high definition helmet mounted display.

Briefer: Mr. Philip Perconti
Project Engineer.
Air Systems Integration Division
ATTN: AMSEL-RD-NV-ASID
COMM.: 703-704-1369

ACTION OFFICER
Thomas T. Steck
Resource Management Division
COMM: 703-704-1188

ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

OBJECTIVE

Demonstrate in flight, revolutionary helmet mounted display technology for night/adverse weather helicopter pilotage. Concentrate on reduced weight, ultra wide field of view, high definition HMDS for insertion into advanced night vision pilotage systems.

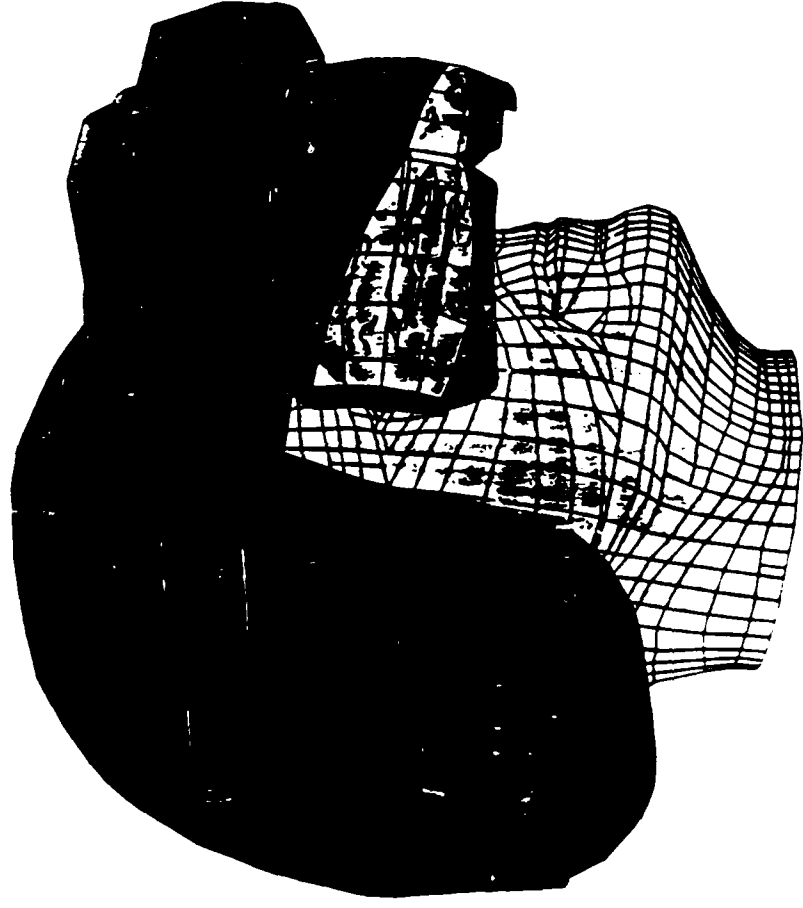
JUSTIFICATION

Reduce pilot workload and increase pilot confidence for more aggressive sensor aided pilotage.

PROPONENT

Mounted Battle Lab

HELMET MOUNTED DISPLAY



ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

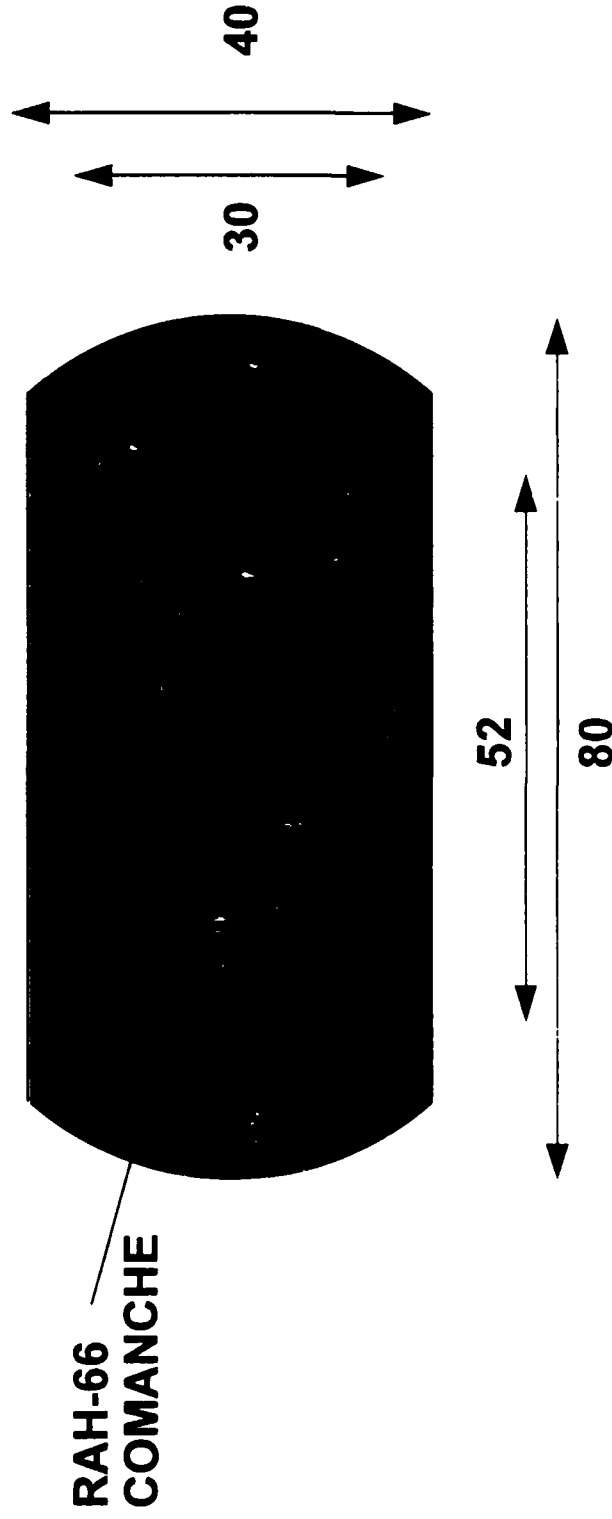
APPROACH

- **Emphasize form/fit/function “EO-System” design for possible AH-64 and RAH-66 P3I -- exponential improvements in performance within given MEP constraints.**
- **Leverage on-going development programs -- incorporate lessons learned from:**
 - **NVEDD HMVS and AHP, A1², ARPA Flat Panels, ATCOM AVS, RAH-66**
- **Explore alternative technology**
- **Image Sources: Deformable Mirror Device (DMD), Field Effect Diodes (FED), Scanned LASER/Light Emitting Diode (LED)**
- **Optics: Holographic, Binary, Plastic**
- **Electronics and Signal Processing: miniaturization**
- **Flight test with the AHP-S Night Vision Sensors**

ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

EXIT CRITERIA

HMD FIELD OF VIEW

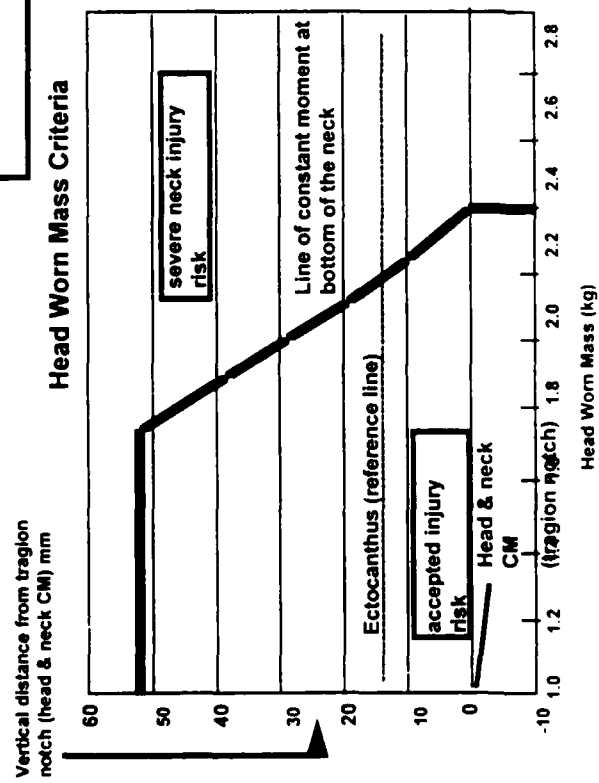


MINIMUM OCULAR: 60°
MINIMUM OVERLAP: 40°
EYE RELIEF: 25 mm

MINIMUM TRANSMISSION: 20%
MINIMUM PEAK LUMINANCE @ EYE: 10 fL
EXIT PUPIL: 15 mm

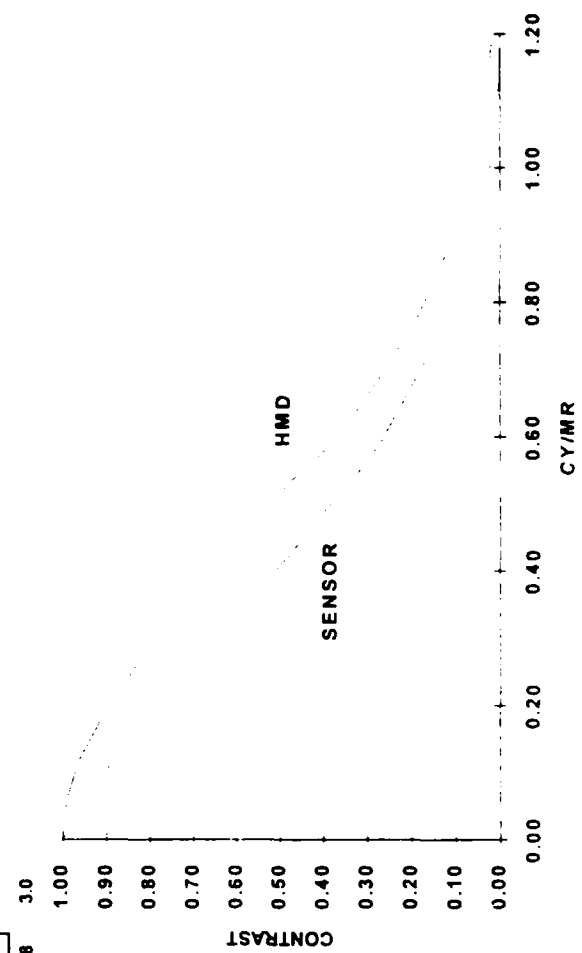
ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

EXIT CRITERIA



REDUCED WEIGHT
IMPROVED CG
WELL WITHIN USAARL LIMITS

MODULATION TRANSFER FUNCTION



ROBUST DISPLAY MTF
WELL MATCHED TO
NIGHT VISION SENSOR

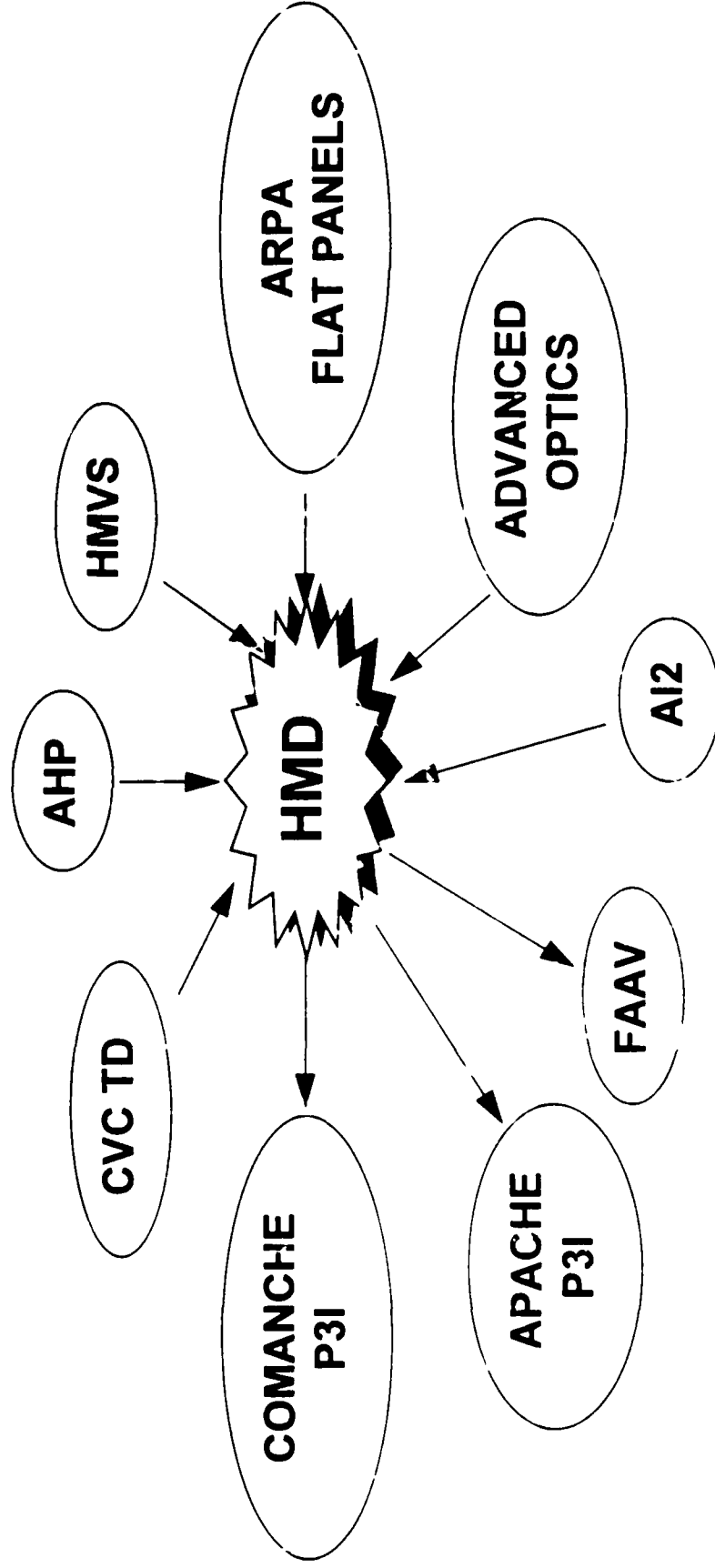
ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT BASELINE RAH-66 NVPS	END TD MINIMUM	GOAL
FIELD OF VIEW	30 (v) x 52 (h)	40 (v) x 80 (h)	40 (v) x 80 (h)
HMD OCULAR OVERLAP	18	40	40
EYERELIEF	22 mm	25 mm	25 mm
EXIT PUPIL	15 mm	15 mm	15 mm
RESOLUTION	HORIZ VERT	HORIZ VERT	HORIZ VERT
(THRU SYSTEM)	0.66 0.44	0.80 0.60	0.86 0.69
VISUAL ACUITY	20/50 20/80	20/43 20/57	20/40 20/50
TRANSMISSION	25%	20%	30%
PEAK LUMINANCE AT THE EYE	100 fL	10 fL	100 fL

ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

RELATIONSHIP TO OTHER PROGRAMS



ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

	FY95	FY96	FY97	FY98	FY99
SOLICITATION (RFP)	■	■			
AWARD		■			
STUDIES & TRADES		■	■		
SYSTEM INTEGRATION			■		
SYSTEM FABRICATION				■	
FLIGHT TEST				■	■

ADVANCED HELMET MOUNTED DISPLAY FOR ARMY ROTORCRAFT

TRANSITION PLAN

- Transition to Program Executive Office-Aviation for Pre-Planned Product Improvement (P3I) and Next Generation Aircraft
 - P3I Comanche
 - P3I Apache
 - Special Operations Aircraft, Future Air Attack Vehicle



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Advanced Helmet Mounted Displays for Army Rotorcraft

OBJECTIVE: Develop and flight test light weight, wide field of view, high resolution HMDS for use with advanced night vision pilotage sensors

PROPOSED CONTRACT TYPE: CPFF

KEY MILESTONES: Contract Award: 3QFY96 - Flight Test 2QFY99
Contract Length: 36 months

ESTIMATED VALUE: \$8 - \$10M

POC TELEPHONE: Mr. Philip Perconti
703-704-1369

All contract actions are dependent upon receipt of FY96 funds.

NOTES



CECOM RDEC
Night Vision and Electronic Sensors
Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

MASKED TARGET KILL
ATD

MR. FRANKLIN DOEPEL
TEAM LEADER
AIR SYSTEMS INTEGRATION DIVISION

AMSEL-RD-NV

15 February 1994

Point Paper

Subject: Masked Target Kill ATD

Objective: Brief Industry on the Masked Target Kill concept

Facts: 1. MTK is a top level demonstration in Science and Technology thrust 3.

2. Optimal solutions for targeting of masked threats will require both radar and electroptical hardware development.

Briefer: Mr. F. T. Doepel

A*tn: AMSEL-RD-NV-ASID

Comm: 703-704-1216

ACTION OFFICER

Thomas T. Steck

Resource Management Division

COMM: 703-704-1188

MASKED TARGET KILL ATD

OBJECTIVE

Provide detection and targeting information for standoff weapons against helicopters that are terrain masked and/or in heavy clutter

JUSTIFICATION

- Key ATD support of Air Defense Top Level Demo
- Air Defense forces are currently ineffective against helicopters in heavy clutter or that are terrain masked
- Provides target acquisition at standoff ranges for non-line-of-sight weapons

PROONENT

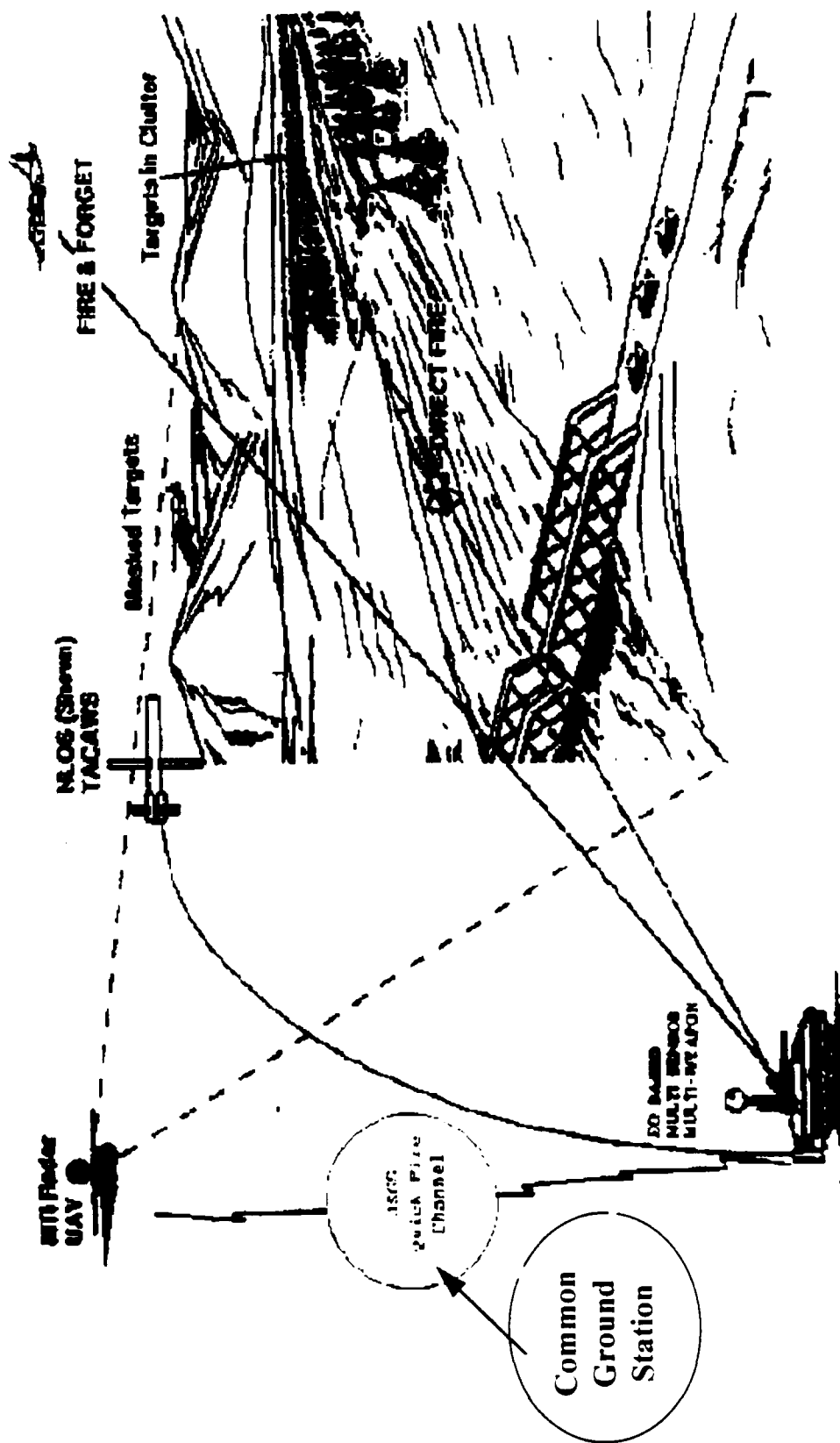
- Air Defense Lab
- Mounted Battle Lab

MASKED TARGET KILL ATD

CONCEPT

- **Masked Target Kill ATD consists of two sensor suites**
 - **E-O based suite for direct engagement (mounted on weapons platform)**
 - **MTI/Classification elevated sensor for non-line-of-sight weapons**

MASKED TARGET KILL ATD



MASKED TARGET KILL ATD

APPROACH

- **Exploit emerging electro-optical and MTI radar technologies**
- **Demonstrate handoff and interoperability with emerging NLOS weapon systems**
- **Apply technology to future Air Defense systems and support associated ATDs**

MASKED TARGET KILL ATD

DIRECT ENGAGEMENT

- **Objective:**
 - Demonstrate passive sensor suite for weapons (at 1.6X Stinger range) for on the move operations
- **Technical Approach:**
 - Volume search - infrared search & track
 - Target acquisition and tracking - high density two dimensional focal plane arrays with special processing capability
 - Early warning/standoff detection - acoustics
- **Platform:**
 - Bradley

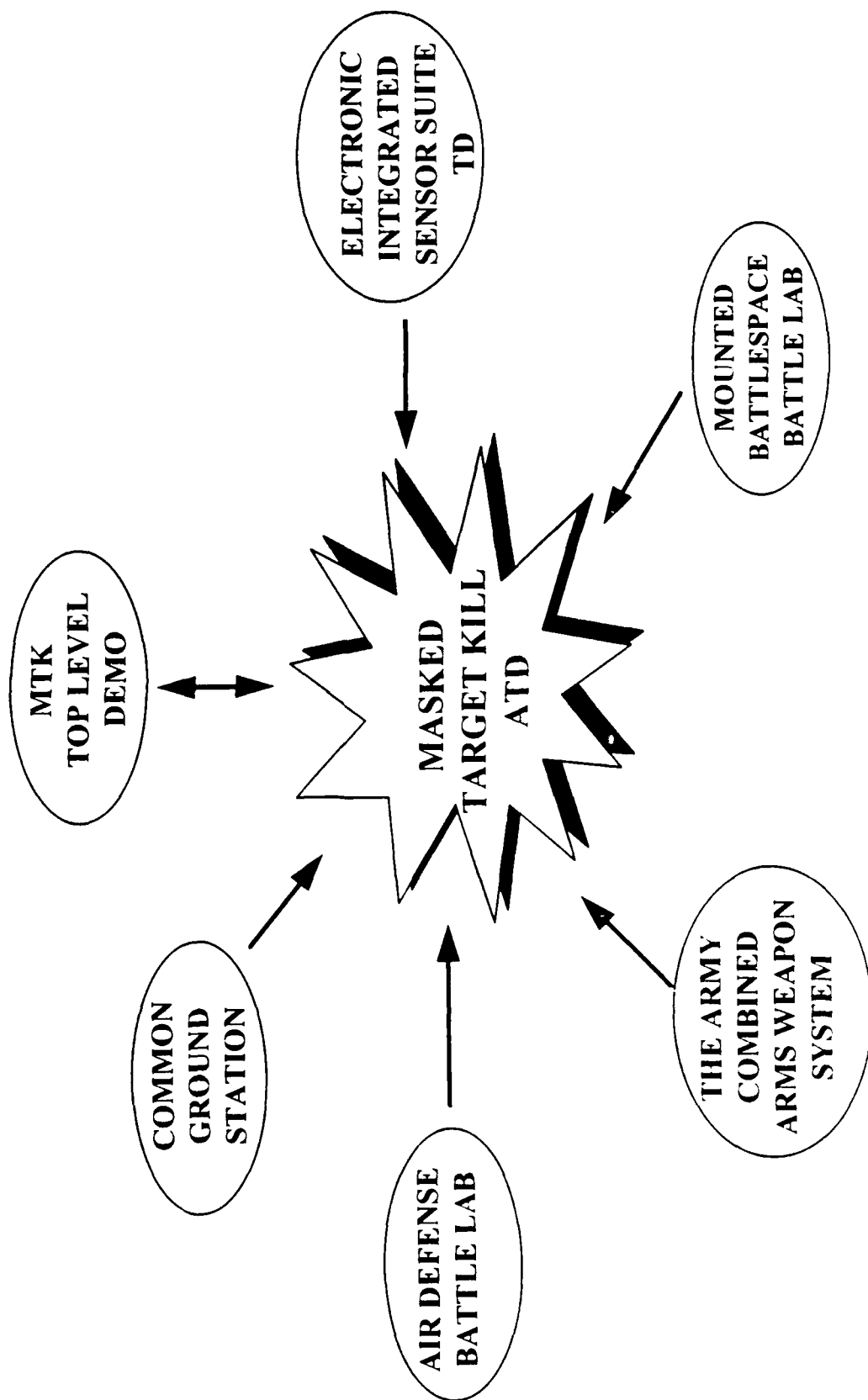
MASKED TARGET KILL ATD

NON-LINE-OF-SIGHT

- **Objective:**
 - Demonstrate elevated targeting payload and handoff capability for NLOS weapons (at 1.6X Stinger range)
- **Technical Approach:**
 - MTI Radar/classification processing
- **Platform:**
 - UAV Short Range (UH-1 Surrogate)

MASKED TARGET KILL ATD

RELATIONSHIPS TO OTHER PROGRAMS/ATDs



MASKED TARGET KILL ATD

EXIT CRITERIA

OPERATIONAL CAPABILITY	CURRENT CAPABILITY	END ATD	
		MINIMUM	GOAL
Direct Engagement	Stinger	1.6X	2X
Indirect	NLOS*	1.6X	2X
On the Move Operation	None	YES	YES

* No Targeting Capability

MASKED TARGET KILL ATD

TRANSITION PLAN

- **PEO Tactical Missiles**
- **PEO Intelligence and Electronic Warfare**

MASKED TARGET KILL ATD

TECHNICAL CHALLENGES

- Large 2D high frame rate focal plane array (FPA)
 - Low noise equivalent temperature for extended range
 - High frame rate for classification processing
- High throughput programmable processors and advanced algorithms
 - Needed for on the move operation
- MTI Radar classification processing

MASKED TARGET KILL ATD

PROGRAM SCHEDULE

EVENT/MILESTONE	FY95	FY96	FY97	FY98	FY99	FY00
Program Start		△				
Studies/Analysis						
Award-Direct						
Award-Indirect						
Integration						
Demonstration						
Top Level Demo						
Transition						



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE:

Masked Target Kill ATD

OBJECTIVE: Provide Detection and Targeting Information for Standoff Weapons Against Helicopters that are Terrain Masked and/or in Heavy Clutter

PROPOSED CONTRACT TYPE: CPAF

KEY MILESTONES:

Contract Awards: FY97

Contract Length: 30-36 months

ESTIMATED VALUE:

\$20 M - \$30 M

POC/TELEPHONE:

Mr. Franklin Doepel

703-704-1216

All contract actions are dependent upon receipt of FY97 funds.

NOTES



CECOM RDEC

**Night Vision and Electronic Sensors
Directorate**



APBI "CECOM Sensor Advanced Technology Demonstrations"

**CLOSE-IN MAN PORTABLE MINE
DETECTOR ATD and FOLLOW-ON PM-MCD DEVELOPMENT**
and
**VEHICULAR MOUNTED MINE DETECTOR TD
and FOLLOW-ON PM-MCD DEVELOPMENT**

**MR. ROBERT L. BARNARD
DIRECTOR, MINE DETECTION DIVISION**

AMSEL-RD-NV-MD

4 February 1994

POINT PAPER

SUBJECT: Close In Man Portable Mine Detector ATD and Development and Vehicular Mounted Mine Detector AT and Development, CECOM Advanced Planning for Industry (APBI), 1994

OBJECTIVE: Provides Industry with Upcoming Business Opportunities within the Night Vision and Electronic Sensors Technology Area for Advanced Planning

FACTS: The purpose of the Man Portable and Vehicular Mounted Mine Detector Programs are to demonstrate the technology maturity in the ATDs and to transition this technology to DEM/VAL.

BRIEFER: Robert L. Barnard
Director, Mine Detection Division
ATTN: AMSEL-RD-NV-MD
COMM: 703-704-1066

ACTION OFFICER
Thomas T. Steck
Resource Management Division
COMM: 703-704-1188

COUNTERMINE TLD

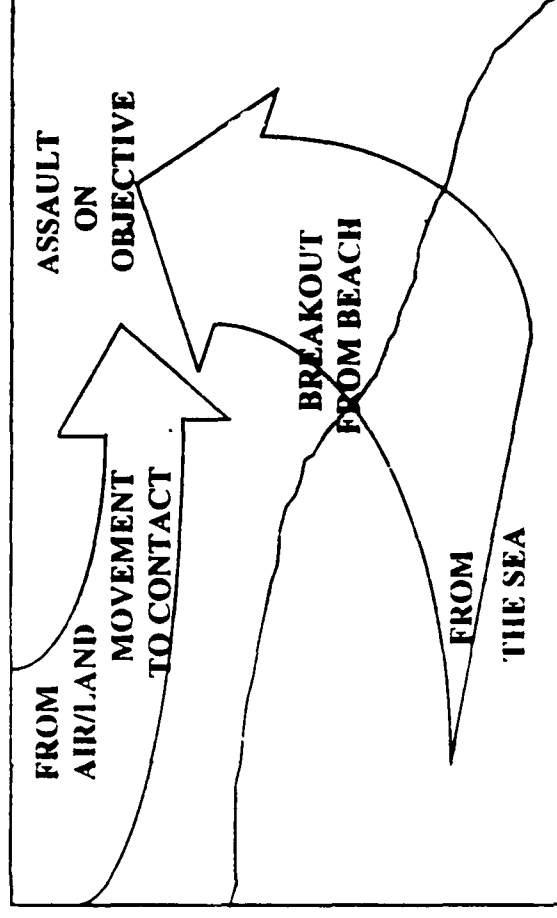
·VISION

Integrated countermine capabilities with C3I linkage to maintain Army and Marine mobility, survivability and agility.

DEMONSTRATION

TLD: Demonstration of detection and breaching capability in four scenarios effective against all mine types.

- Expand the Lodgement (Light)
- Breakout from the Beach (Medium)
- Movement to Contact (Heavy)
- Assault on Objective (Heavy)



INTEGRATION WITH CAC2

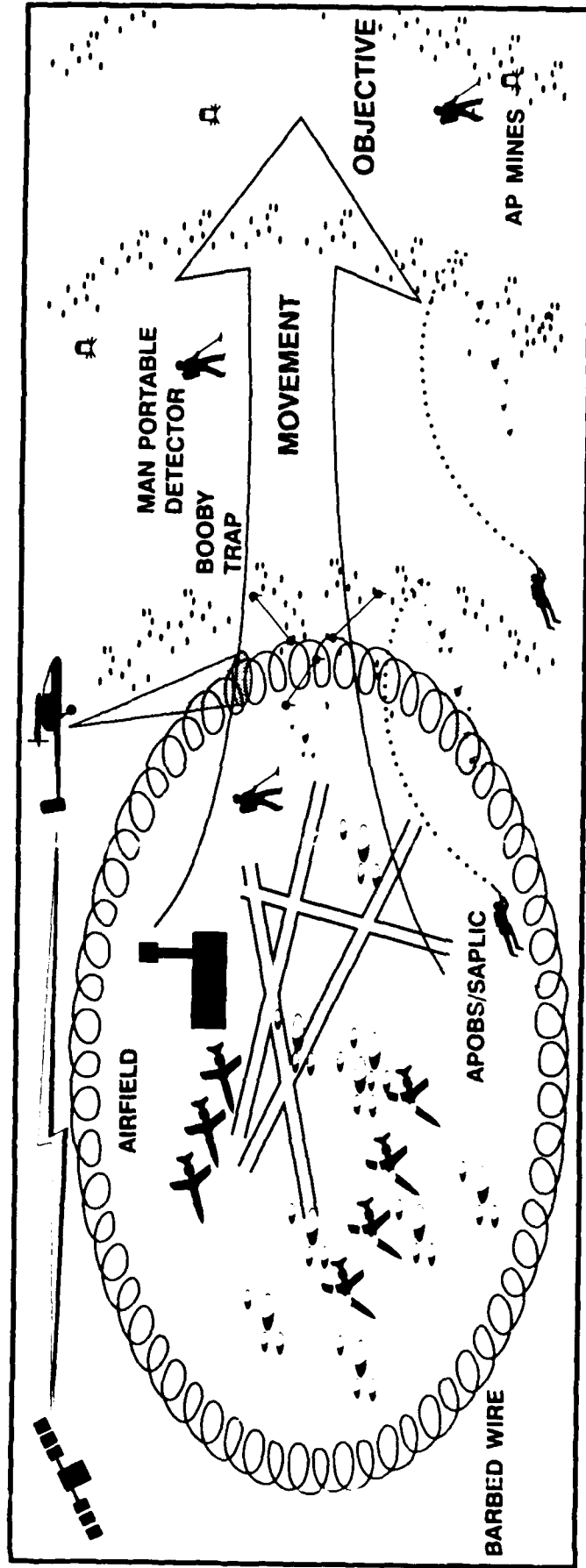
PACING TECHNOLOGIES (Army/USMC)

- Sensors - IR, Microwave, Multispectral
- Seismic and Acoustic Decoys
- Explosive and Directed Energy Neutralization
- Information Processing
- Robotics

OPERATIONAL ADVANTAGES

- Freedom to maneuver on land
- Fewer losses to mines and direct/indirect fire
- Less delay/more force synchronization
- Avoid cheap kills in Third World

EXPAND THE LODGEMENT



OBJECTIVES

- LOCATE PERIMETER OBSTACLES PRIOR TO MISSION
- START TO PERFORM PERIMETER OBSTACLES WITH MAN PORTABLE ASSETS — BARBED WIRE, AP MINES AND BOOBY TRAPS

COUNTERMINE

ATD/TD/DEMO	FUNCTION
ASTAMIDS M16, C-2A, C-2B (C-2A, C-2B)	STANDOFF DETECTION SITUATIONAL AWARENESS (COMMUNICATION) DIRECTION
APOBS, SAPLIC	DISMOUNTED NEUTRALIZATION

CLOSE-IN MAN PORTABLE MINE DETECTOR ATD **and FOLLOW-ON PM-MCD DEVELOPMENT**

OBJECTIVE

To develop mine detection technology to detect buried metallic and non-metallic anti-personnel and anti-tank mines at a rate commensurate with dismounted mobility on the battlefield to enhance the dismounted soldiers operational capability and survivability.

JUSTIFICATION

- Show capability for dismounted soldiers to detect metallic and non-metallic mines and booby traps
- Show improved mobility and survivability
- Show force insertion capability
- Show detection capability to assure cleared MSRs and LOCs

PROPONENT

- US Army Engineer School

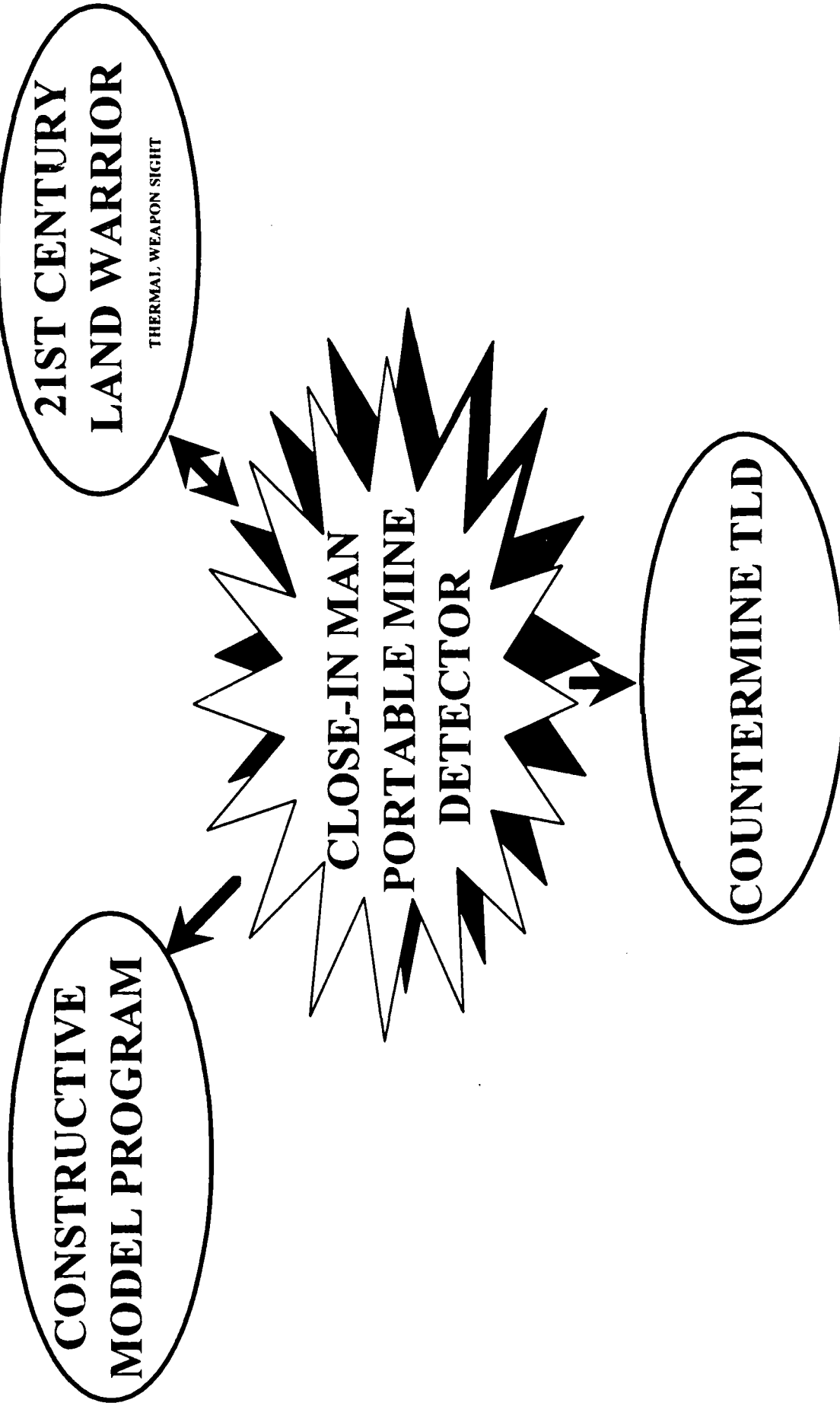
CLOSE-IN MAN PORTABLE MINE DETECTOR ATD **and FOLLOW-ON PM-MCD DEVELOPMENT**

APPROACH

- FY95 Conduct Spring Technology Evaluation
- FY96 RFP PM-MCD solicitation for an ergonomically designed mine detector with automated targeting capability and standoff detection desirable
- Support engineers, dismounted soldier, and USMC
- Integrate algorithm with 21st Century Land Warrior Thermal Weapon Sight

CLOSE-IN MAN PORTABLE MINE DETECTOR ATD
and FOLLOW-ON PM-MCD DEVELOPMENT

RELATIONSHIP TO OTHER PROGRAMS



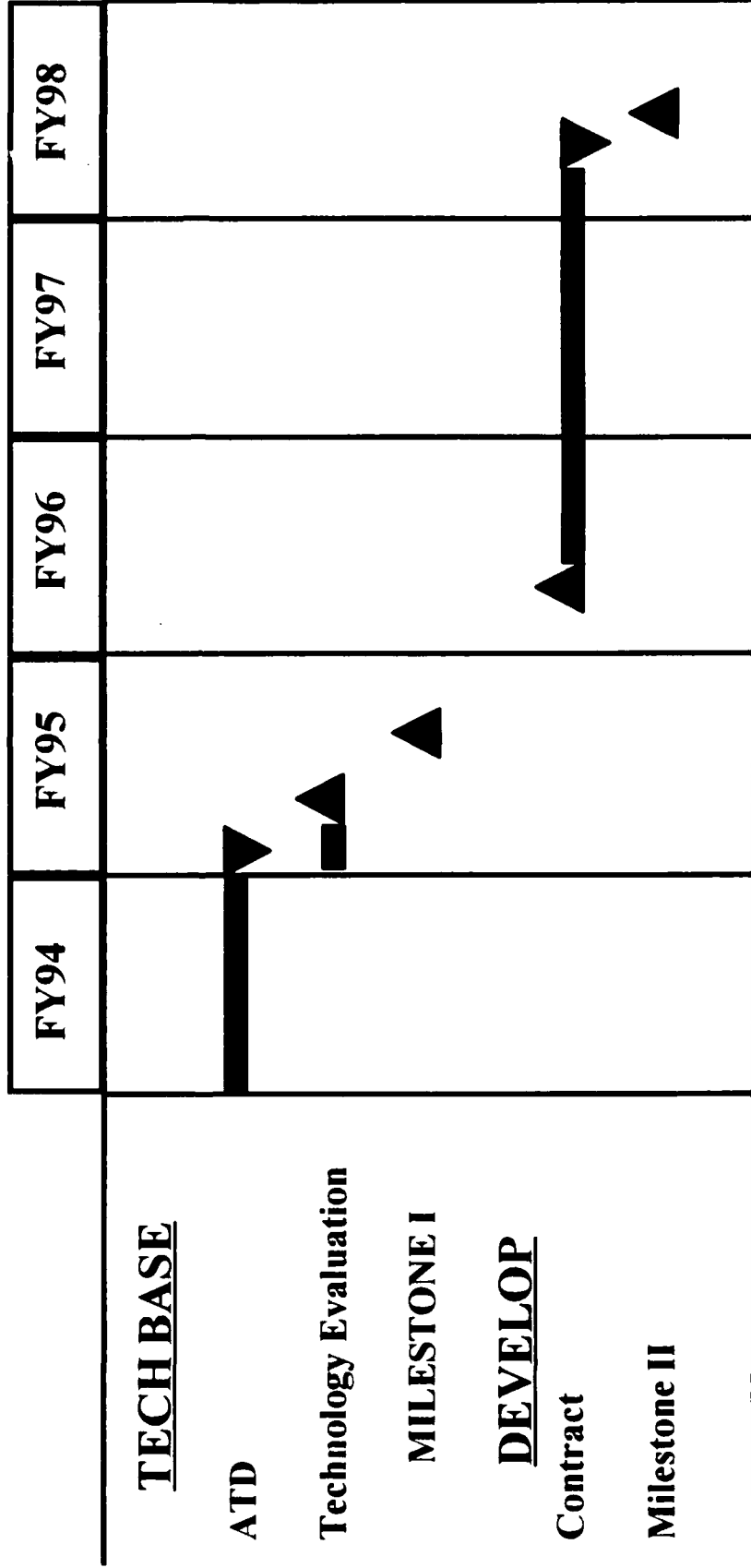
CLOSE-IN MAN PORTABLE MINE DETECTOR ATD and FOLLOW-ON PM-MCD DEVELOPMENT

EXIT CRITERIA

Detection Capability Non-Metallic Mines	Baseline	Required	Desired
Buried, off road	Metal Detector	80%	100%
Surface mines	Metal Detector	90%	100%
Buried, nuisance mines on unpaved roads	Metal Detector	90%	100%
Scan rate	Metal Detector	8.5 m ² /min	15 m ² /min
False alarm rate	Metal Detector	1 per 5m ²	0

CLOSE-IN MAN PORTABLE MINE DETECTOR ATD **and FOLLOW-ON PM-MCD DEVELOPMENT**

PROGRAM SCHEDULE





CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

DEMONSTRATION OPPORTUNITY

TITLE: Close-In Man Portable Mine Detector-Technology Base

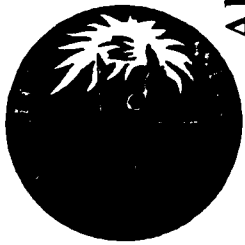
OBJECTIVE: Demonstrate detection of buried and surface emplaced metallic and non-metallic mines

INDUSTRY OPPORTUNITY: Demonstrate Technology in Spring evaluation.

KEY MILESTONES: Spring Technology Evaluation, FY95

POC TELEPHONE: Mr. Robert Barnard
(703) 704-1066

All contract actions are dependent upon receipt of FY95 funds.



CECOM RDEC
Night Vision and Electronic Sensors
Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: PM-MCD Close-In Man Portable Mine Detector-Development

OBJECTIVE: Develop a detector to detect buried and surface emplaced metallic and non-metallic mines

PROPOSED CONTRACT TYPE: TBD

KEY MILESTONES: Contract Award - 2QFY96
Contract Length - 24-27 months

ESTIMATED VALUE: \$15 - \$20M

POC TELEPHONE: Mr. Lawrence J. Nee Chief, Countermine Division PM-MCD
(703) 704-1970

All contract actions are dependent upon receipt of FY96 funds.

VEHICULAR MOUNTED MINE DETECTOR DEVELOPMENT

OBJECTIVE

To develop mine detection technology for the detection of buried metallic and non-metallic anti-tank mines across the full vehicle width at a rate commensurate with mounted mobility on the battlefield to enhance the mounted force operational capability and survivability.

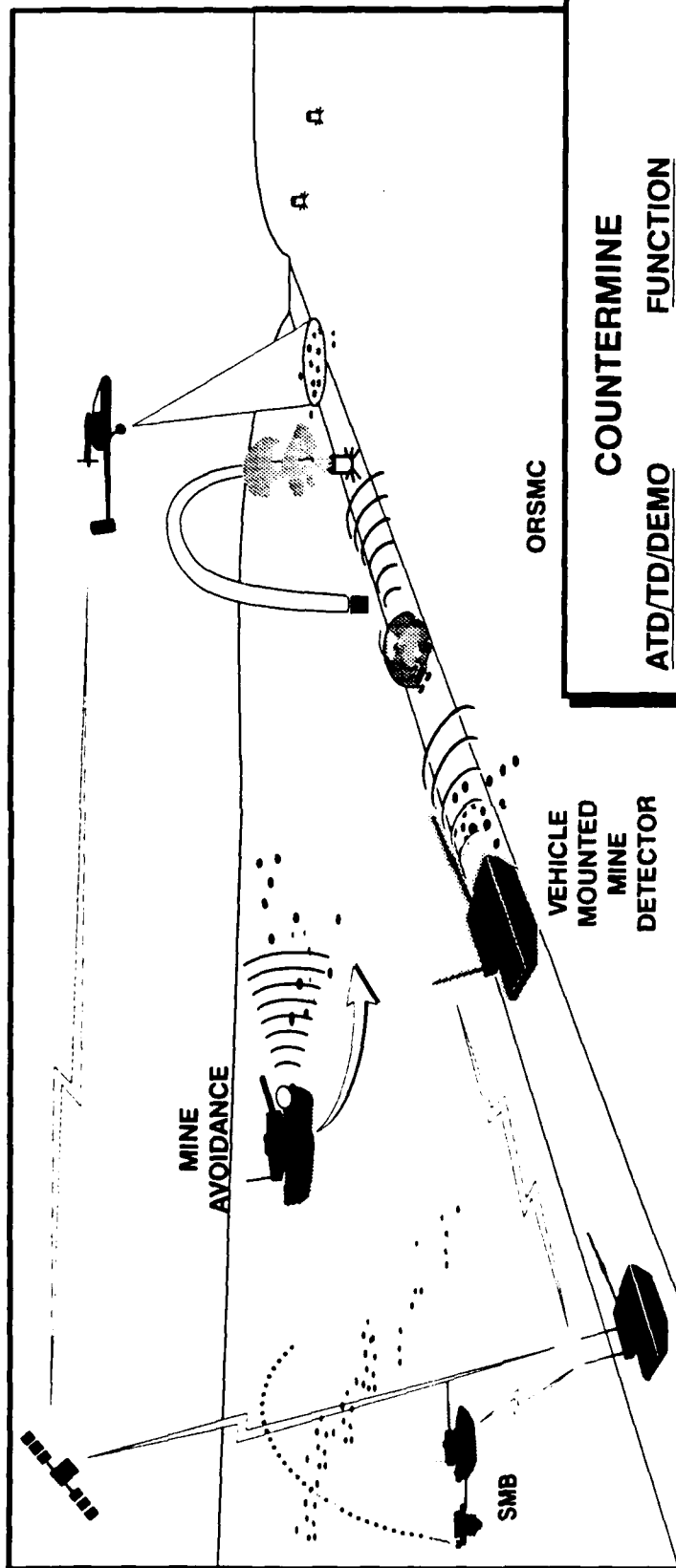
JUSTIFICATION

- Capability to detect metallic and non-metallic mines both on and off roads at moderate speeds
- Enhances overall mobility and survivability for heavy and light forces

PROPONENT

- US Army Engineer School

MOVEMENT TO CONTACT



OBJECTIVES

- LOCATE & DISTRIBUTE MINEFIELD LOCATIONS — NEAR REAL TIME
- AVOID MINEFIELDS IN-STRIDE — ROUTE DECISIONS MADE IN ADVANCE
- DETECT OR COUNTER OFF ROUTE MINES
- REPORT NEW MINEFIELD LOCATIONS DIGITALLY
- MARK MINEFIELD LOCATIONS — PHYSICALLY AND DIGITALLY

COUNTERMINE

ATD/TD/DEMO

ASTAMIDS
IVIS, CAC2
VEHICLE MTD
MINE DETECTOR
(ORSMC)

FUNCTION

STANDOFF DETECTION
SITUATIONAL AWARENESS
MINEFIELD DETECTION
OFF-ROUTE ATTACK
NEUTRALIZATION
EXPLOSIVE
NEUTRALIZATION
VEHICLE PROTECTION

SMB

VEMASID

VEHICULAR MOUNTED MINE DETECTOR DEVELOPMENT

APPROACH

- FY97 Conduct Spring Technology Evaluation
- FY98 RFP PM-MCD solicitation for a vehicle mounted mine detector with automated targeting capability and standoff detection
- Supports heavy and light forces

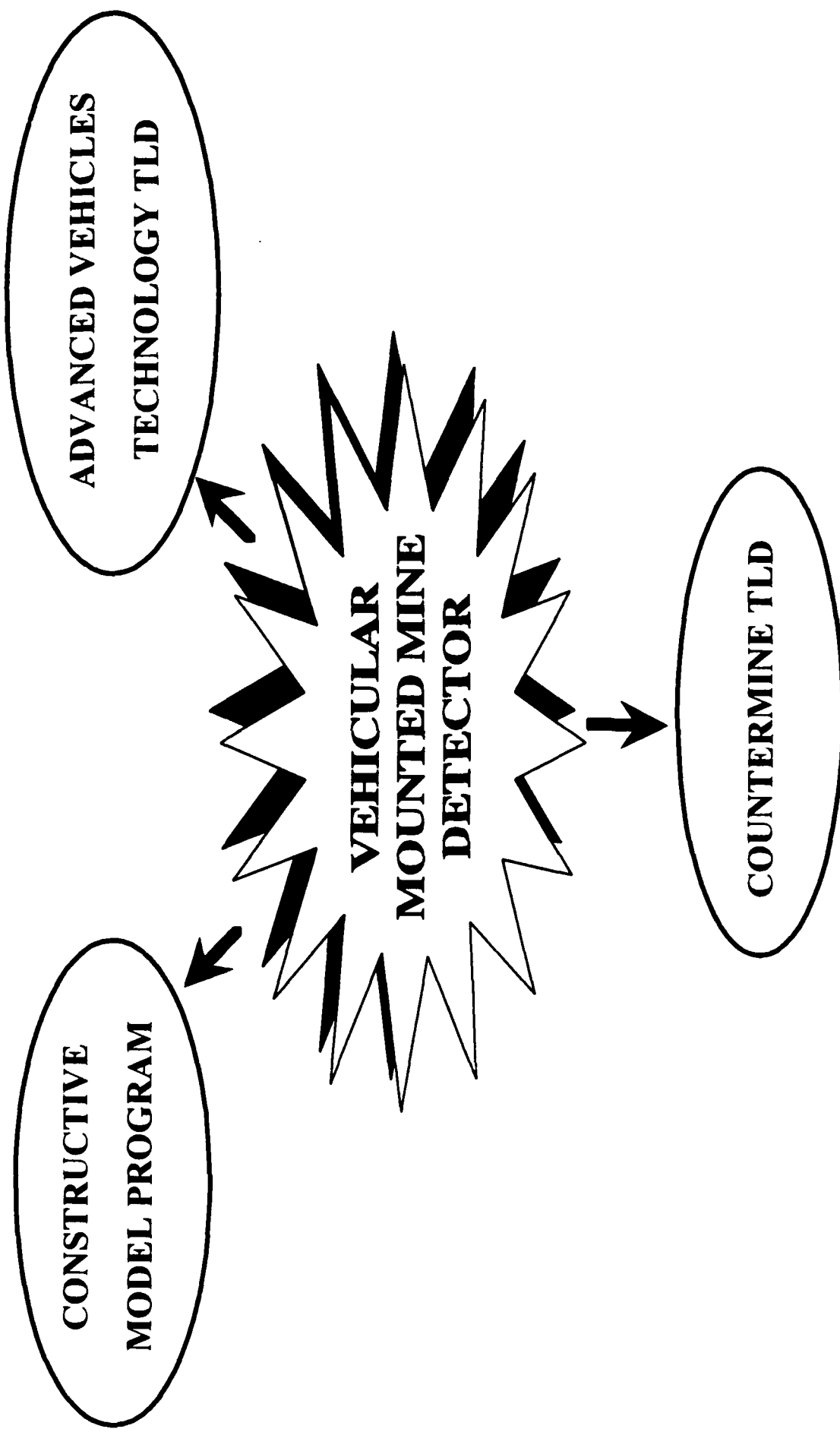
VEHICULAR MOUNTED MINE DETECTOR DEVELOPMENT

EXIT CRITERIA

Detection Capability	Baseline	Required	Desired
Buried mines	None	80%	100%
Surface mines	None	90%	100%
Vehicle speed	None	5 km/h	15 km/h
False Alarm Rate	None	< 0.5 per meter	0

VEHICULAR MOUNTED MINE DETECTOR DEVELOPMENT

RELATIONSHIP TO OTHER PROGRAMS



VEHICULAR MOUNTED MINE DETECTOR DEVELOPMENT

PROGRAM SCHEDULE

	FY94	FY95	FY96	FY97	FY98	FY99	FY00
<u>TECH BASE</u>							
Technology Demonstration							
Technology Evaluation							
MILESTONE I							
<u>DEVELOP</u>							
Contract Award							
Milestone II							



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APBI "CECOM Sensor Advanced Technology Demonstrations"

DEMONSTRATION OPPORTUNITY

TITLE: Vehicular Mounted Mine Detector - Technology Base

OBJECTIVE: Demonstrate detection of metallic and non-metallic mines from a standoff distance

INDUSTRY OPPORTUNITY: Demonstrate technology in Spring evaluation.

KEY MILESTONES: Spring Technology Evaluation, FY97

POC TELEPHONE: Mr. Robert Barnard
(703) 704-1066

All contract actions are dependent upon receipt of FY97 funds.



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**Night Vision and Electronic Sensors
Directorate**



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: PM-MCD Vehicular Mounted Mine Detector-Development

OBJECTIVE: Develop a detector to detect buried and surface metallic and non-metallic mines across a vehicle width

PROPOSED CONTRACT TYPE: TBD

KEY MILESTONES: Contract Award - 2QFY98
Contract Length - 30 months

ESTIMATED VALUE: \$18 - \$22M

POC TELEPHONE: Mr. Lawrence J. Nee Chief, Countermine Division PM-MCD
(703) 704-1970

All contract actions are dependent upon receipt of FY98 funds.

NOTES



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APBI "CECOM Sensor Advanced Technology Demonstrations"

OFF-ROUTE SMART MINE CLEARANCE ATD
and
FOLLOW-ON PM-MCD DEVELOPMENT

MR. RICHARD C. WEAVER
DIRECTOR, MINE NEUTRALIZATION DIVISION

7 February 1994

POINT PAPER

SUBJECT: Off-Route Smart Mine Clearance ATD and Follow-on Development, CECOM Advanced Planning for Industry (APBI) on Off-Route Smart Mine Clearance (ORSMC) Advanced Technology Demonstration

OBJECTIVE: Provides Industry with upcoming Business Opportunities to Support the Development of Off-Route Smart Mine Clearance Technologies

FACTS: Advances in target sensing and tracking technology are resulting in the development of a family of Smart Mines capable of identifying and attacking their targets from ranges of several hundred meters. These mine use acoustic and seismic sensors to detect, classify, track, and launch a sub munition, typically with its own terminal sensors, toward an approaching target. The current ORSMC program is exploring active decoy technologies to "trick" smart mines into an erroneous launch of their submunition.

Survivability of the decoy platform will be ensured by integrating low observable technologies to defeat the millimeter wave and infrared terminal sensors utilized by the sub munition. The purpose of the follow-on development effort will focus on defining the design and expected capabilities of the ORSMC system by fabricating early prototypes to serve as a basis for validating a system specification.

BRIEFER: MR. RICHARD C. WEAVER
Director, Mine Neutralization Division
ATTN: AMSEL-RD-NV-MN
COMM: (703) 704-1090

ACTION OFFICER
Thomas T. Steck
Resource Management Division
COMM: 703-704-1188

OFF-ROUTE SMART MINE CLEARANCE

OBJECTIVE

Develop Technologies and Concepts to Neutralize Advanced Off-Route Smart Mines

- Top Attack Anti-Tank Mines**
- Side Attack Anti-Tank Mines**

Clear Way for Obstacle Breaching and Line of Communication Clearing Operations

JUSTIFICATION

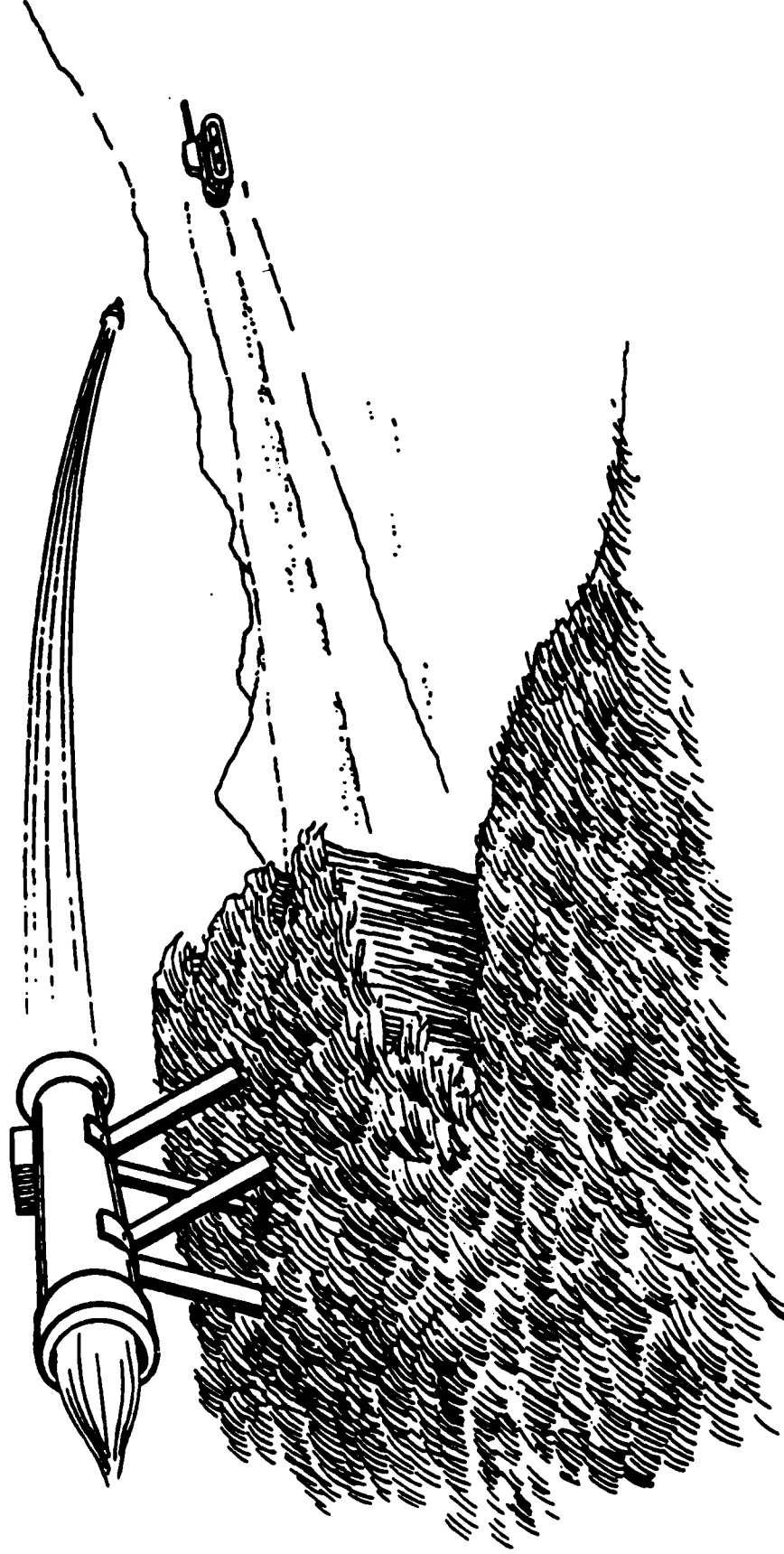
- Defeats Smart Standoff Mines Against which the User Currently has no Capability**
- Enhances Overall Force Mobility and Survivability for Heavy and Light Forces**

PROONENT

- Mounted Battle Lab**
- US Marine Corps**
- US Army Engineer School**

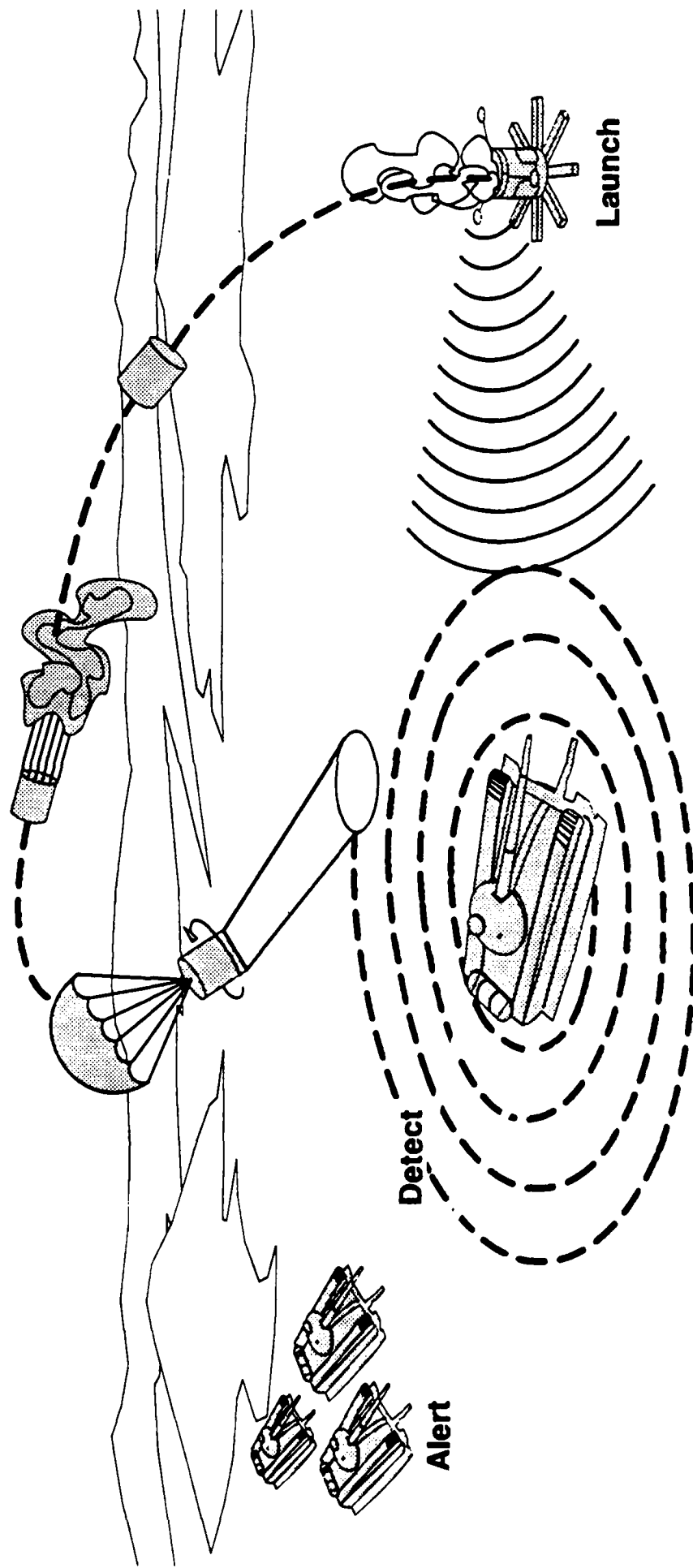
OFF-ROUTE SMART MINE CLEARANCE ATD and FOLLOW-ON DEVELOPMENT

SIDE ATTACK ANTI-TANK MINE



OFF-ROUTE SMART MINE CLEARANCE ATD and FOLLOW-ON DEVELOPMENT

TOP ATTACK ANTI-TANK MINE



OFF-ROUTE SMART MINE CLEARANCE

APPROACH

- **Projection of Multi-Spectral Target Signatures**
- **Draws Fire from Smart Standoff Mine Systems**
- **Survive Sensored Mine Sublets Through Low Observable Technologies**

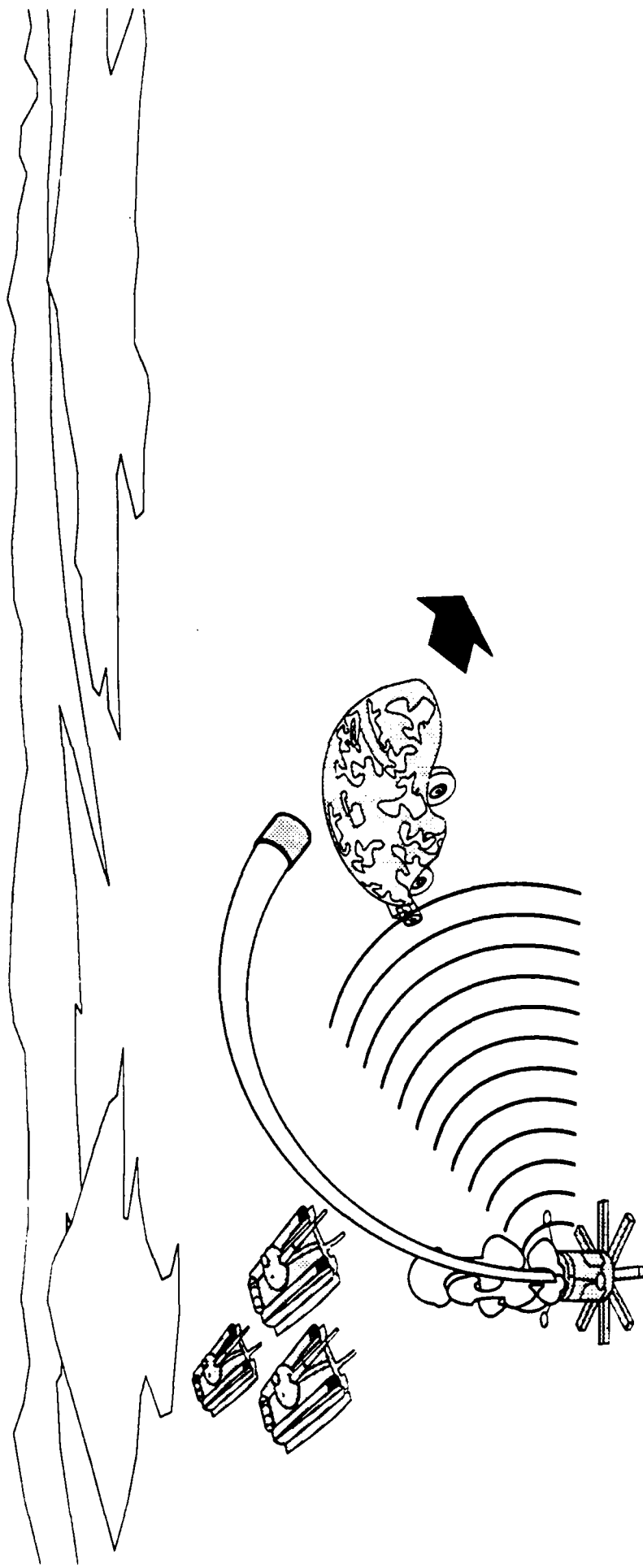
OFF-ROUTE SMART MINE CLEARANCE

COUNTERMEASURE TECHNIQUES

- **Single Decoy**
- **Multiple Decoys (Ghost)**
- **Strobed Acoustic Module System (SAMS)**

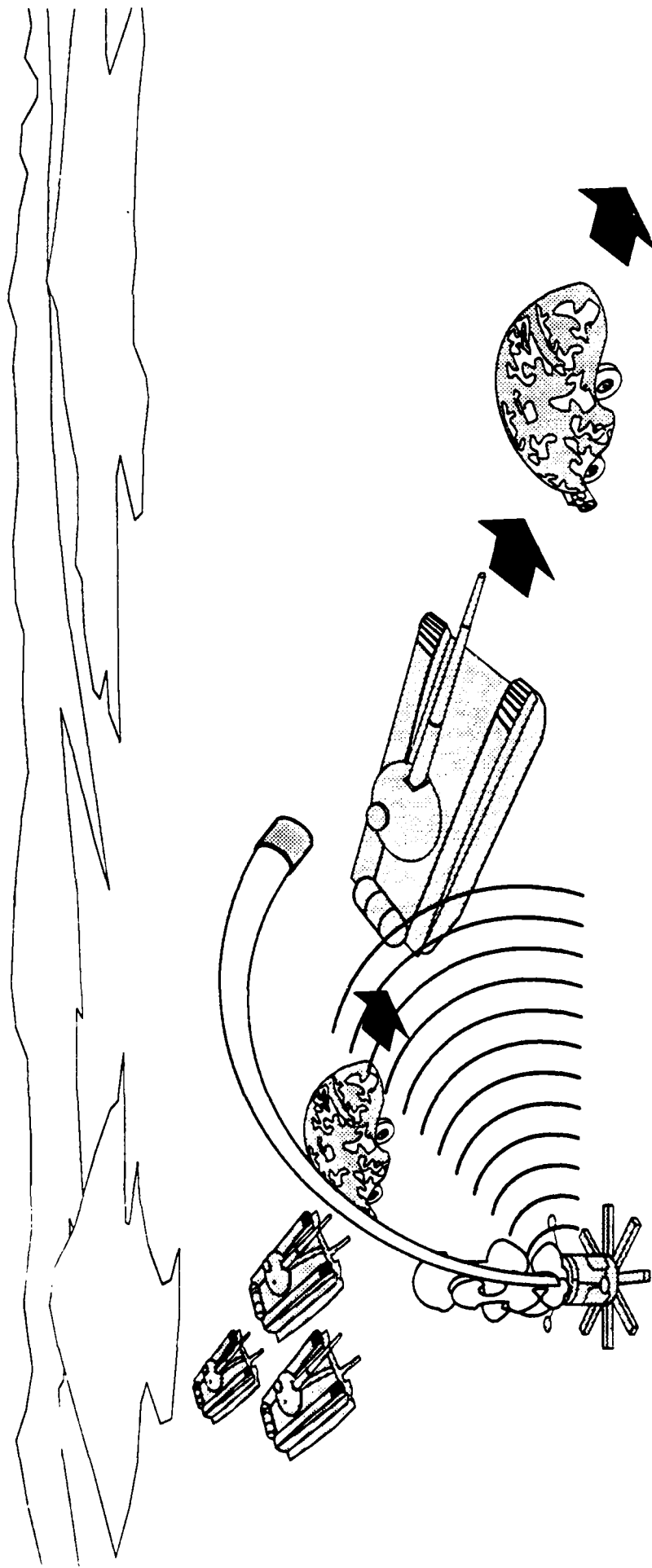
OFF-ROUTE SMART MINE CLEARANCE ATD and FOLLOW-ON DEVELOPMENT

DECOY TECHNIQUE



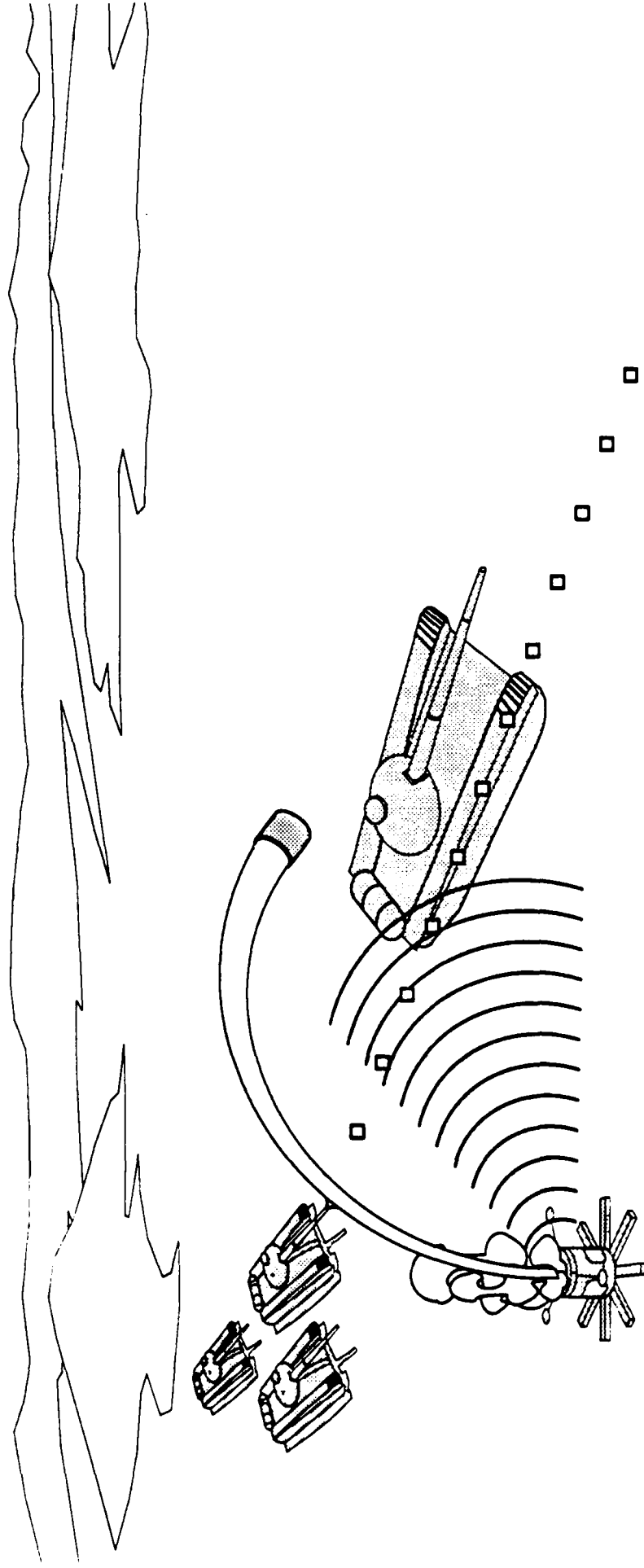
OFF-ROUTE SMART MINE CLEARANCE ATD and FOLLOW-ON DEVELOPMENT

GHOST TECHNIQUE



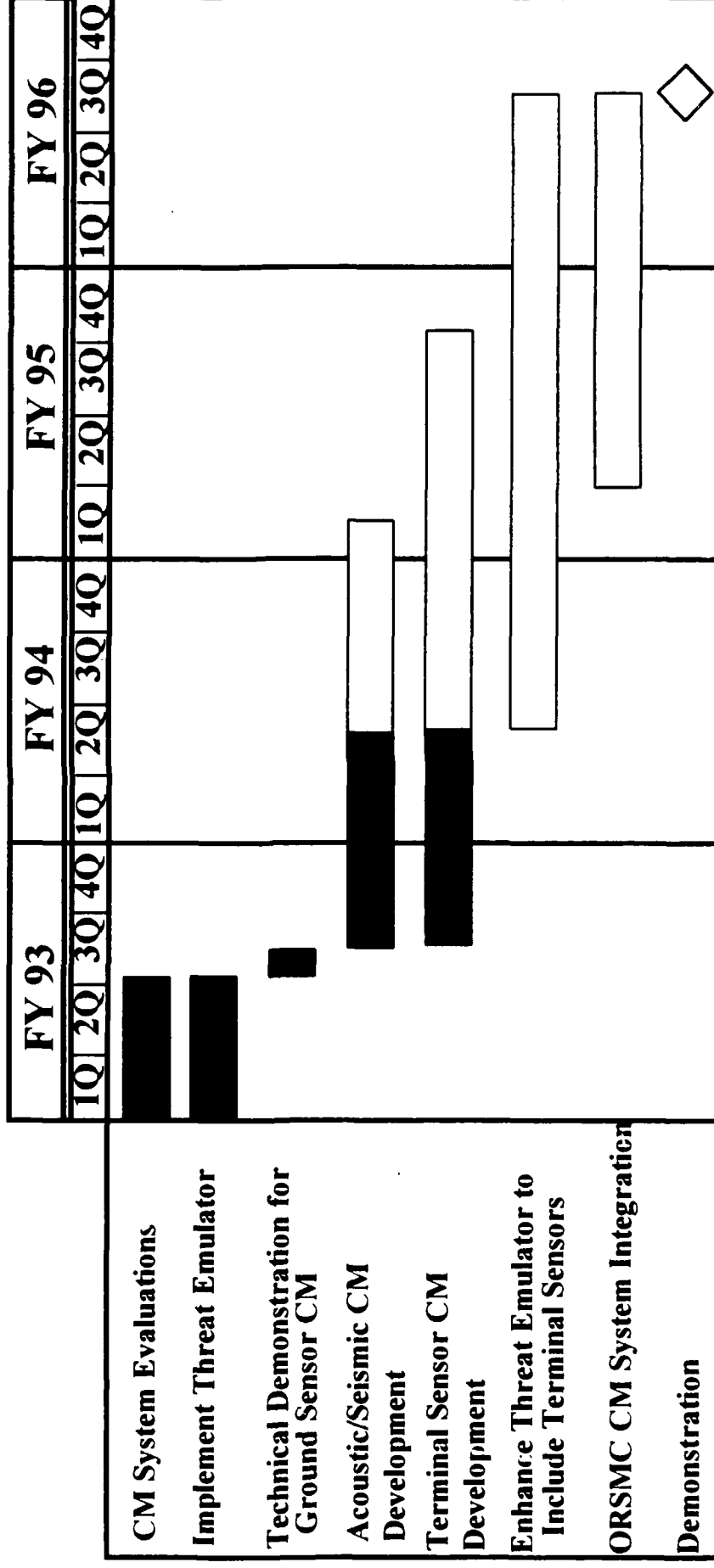
OFF-ROUTE SMART MINE CLEARANCE ATD and FOLLOW-ON DEVELOPMENT

SAMS TECHNIQUE



OFF-ROUTE SMART MINE CLEARANCE

PROGRAM SCHEDULE



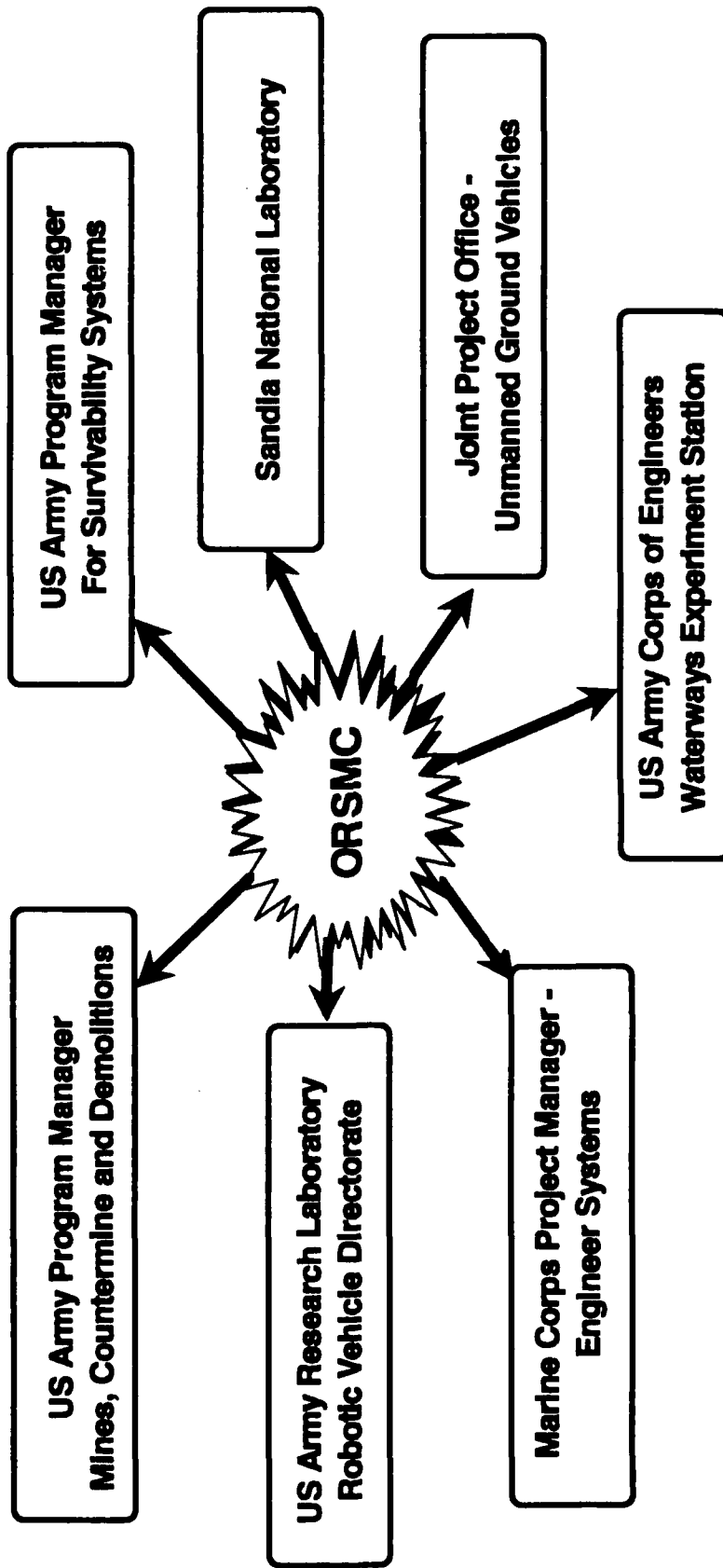
OFF-ROUTE SMART MINE CLEARANCE

EXIT CRITERIA

CATEGORY	BASELINE	ATD GOALS	NOTIONAL REQUIREMENTS
Mission	None	Demonstrate ORSMC neutralization capability in limited operational environment	Provide capability for in-stride breach of smart minefields
Coverage Area / Neutralization Probability	None	Neutralize 90% of Off-Route Smart Mines in 100m radius of ORSMC	Neutralize 95% of Off-Route Smart Mines from a distance commensurate with threat system capabilities
Neutralization Speed	None	10 mph	In stride with combat operations
Survivability	None	Less than 0.25 probability of vehicle kill from a warhead launch	Less than 0.05 probability of vehicle kill after warhead launch
Operating Environment	None	Day/Night operation/Limited terrain	Day/Night operation; All weather; All terrain
Vehicle Control	None	Remote control of a light wheeled vehicle; no operator exposure	Robotic/autonomous vehicle deployment; no operator exposure

OFF-ROUTE SMART MINE CLEARANCE

PARTICIPATING GOVERNMENT AGENCIES



OFF-ROUTE SMART MINE CLEARANCE

TRANSITION INTO DEVELOPMENT

- **FY96 MSI - Transition to PM Mines, Countermine, and Demolitions to Complete Development and Fielding**



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Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: Off-Route Smart Mine Clearance System

OBJECTIVE: Develop and evaluate countermeasure concepts for integration into the Off-Route Smart Mine Clearance ATD.

PROPOSED CONTRACT TYPE: TBD

KEY MILESTONES: Contract Award - 2QFY95

ESTIMATED VALUE: \$85 - \$250M

POC TELEPHONE: Mr. Richard Weaver, Director, Mine Neutralization Division
703-704-1090

All contract actions are dependent upon receipt of FY95 funds.



CECOM RDEC

Night Vision and Electronic Sensors Directorate



APBI "CECOM Sensor Advanced Technology Demonstrations"

CONTRACT OPPORTUNITY

TITLE: PM-MCD Off-Route Smart Mine Clearance Development

OBJECTIVE: Development and fabrication of prototype systems for technical Test/Operational Test-1.

PROPOSED CONTRACT TYPE: TBD

KEY MILESTONES: Milestone-1 - 4QFY96
Contract Award - 2QFY97
Contract Length: 24-27 months

ESTIMATED VALUE: \$15 - \$20M

POC TELEPHONE: Mr. Larry Nee, Chief, Countermine Division PM-MCD
703-704-1970

All contract actions are dependent upon receipt of FY97 funds.

NOTES

SYMPOSIUM
PARTICIPANTS

MR. ROBERT F. GIORDANO

HQ, US Army Communications-Electronics Command
Director, Research, Development and Engineering Center
AMSEL-RD
Fort Monmouth, New Jersey 07703
(908) 544-2686

DR. RUDOLF G. BUSER

HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Director, Night Vision and Electronic Sensors
AMSEL-RD-NV-D
Fort Belvoir, Virginia 22060-5806
(703) 704-1172

MR. ROBERT L. BARNARD

HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-MD
Fort Belvoir, Virginia 22060-5806
(703) 704-1066

MR. LARRY L. FILLIAN

HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-D
Fort Belvoir, Virginia 22060-5806
(703) 704-1172

MR. WAYNE T. GRANT

HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-LP
Fort Belvoir, Virginia 22060-5806
(703) 704-1686

MR. FRANCIS J. SCHRENK

PEO INTELLIGENCE AND ELECTRONIC WARFARE
Vint Hill Farm Station
SFAE-IEW-SE
Warrenton, Virginia 22186-5115
(703) 349-5188

MR. RICHARD C. WEAVER
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-MN
Fort Belvoir, Virginia 22060-5806
(703) 704-1090

MR. FRANKLIN T. DOEPEL
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-GSI
Fort Belvoir, Virginia 22060-5806
(703) 704-1216

MR. RAYMOND A. IRWIN
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-SE
Fort Monmouth, New Jersey 07703
(908) 544-4589

MR. TERRY L. JONES
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-TTP
Fort Belvoir, Virginia 22060-5806
(703) 704-1700

MR. MARTIN WEAVER
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-MN
Fort Belvoir, Virginia 22060-5806
(703) 704-1297

MR. JAMES R. MATHENY
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-ASI
Fort Belvoir, Virginia 22060-5806
(703) 704-1193

MR. TIMOTHY M. WATTS
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-GSI
Fort Belvoir, Virginia 22060-5806
(703) 704-1356

MR. PHILIP PERCONTI
HQ, US Army Communications-Electronics Command
Research, Development and Engineering Center
Night Vision and Electronic Sensors Directorate
AMSEL-RD-NV-ASI
Fort Belvoir, Virginia 22060-5806
(703) 704-1369